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ABSTRACT

The need for health personnel in California and recommended targets for expansion of health sciences programs are presented in this report prepared for the California Postsecondary Education Commission. The report focuses on the role of physicians, mid-level practitioners, nurses, pharmacists, dentists, optometrists, and health sciences education. Supply trends and projections, demand, utilization, clinical training, and special problems, and recommendations are considered for each field. Pertinent national legislation is assessed and it is suggested that the true impact of this legislation will not be felt on the state level for at least a decade. The effect of professional liability insurance rate increases on patterns of physician practice are also presented for the State as well as the impact of national health insurance on health manpower. Health sciences education programs are discussed focusing on the needs of the health care delivery system that are amenable to change via the educational system, and needs of the educational system itself. System changes that are recommended in the education field include improved practitioner attitudes toward primary care, and prevention of disease through patient and health education. Data for health services professionals including: geographic distribution, field, and speciality are appended as well as a list of accredited health professions schools in California and degrees conferred. An explanation of the basic project methodology is also included. (SF)

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HEALTH MANPOWER STUDY OF SELECTED HEALTH PROFESSIONS IN CALIFORNIA

1976

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HEALTH MANPOWER STUDY OF SELECTED HEALTH PROFESSIONS IN CALIFORNIA

1976

A Report Prepared
for the
California Postsecondary Education Commission

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I. INTRODUCTION AND BACKGROUND OF STUDY

1. INTRODUCTION

It is always tempting for those of us who have been given the opportunity to prepare a report on health manpower to idealize the situation--to make projections of a perfect health care delivery system, picturing a perfect mix of professionals and auxiliaries working in an efficiently organized service delivery environment. If the above assumptions were true, there is no doubt that our need for health manpower could drop drastically from the current level. The fact is we do not even come near an efficient system, but instead we have an illogical combination of health workers who have proliferated at different times in an unplanned manner. They work in a gamut of uncoordinated institutions and agencies.

To predict the need for health personnel for our State, the assumptions of how health care service will be organized and delivered and the degree of responsibility the consumer will take in caring for himself must be made.

Although we can be justifiably proud of the advancements we have made in health care technology, we as a nation give little thought to coordinated health planning. Self-imposed risks and the environment are the principle underlying factors in each of the major health problems today--heart disease, cancer, accidents, drug abuse, and emotional illness. It has often been asserted, for example, that changes in the socioeconomic and cultural environment affecting everything from diet and housing to life style, have a far greater impact on health status than all the acute health health care services, which suggests that the nation's health providers should concentrate on changing health behavior by individuals. It also has become clear in recent years, that only by preventing disease from occurring rather than treating it later can we hope to achieve any major improvement in the nation's health.

Victor R. Fuchs in his book, Who Shall Live, Health, Economics and Social Choice, said, "In a sense medical care is to health what schooling is to wisdom. No society can truthfully promise to make everyone wise, but society can make schooling freely available. Our government, could, if it wished to, come close to assuring access to medical care for all persons. But no government now or in the foreseeable future can assure health to every individual."

There are health problems that cannot be solved solely by providing health services but rather must be attacked by offering the California people protection, information, and services through which they will themselves become partners with health professionals in the preservation and enhancement of their vitality so that they will live full, happy, long and illness-free lives.

If the California government were to give as much attention to preventive care, the environment, and life style as it has to the financing of sick care organizations, then all avenues to improved health would be pursued with equal vigor.

Organized programs for improving consumer health behavior and habits should be given top priority, moral and financial support.

It is important to recognize that there are alternative patterns of delivery of health services and that they impact differently on health manpower.

This study follows the assumption that the current mode of delivery is essentially sick-care oriented and is likely to continue that way. Without substantial intervention at the state and national levels to steer it in other directions, the change away from this mode of delivery will be slow.

Under these assumptions, the state of California will undoubtedly need to produce significant numbers of primary care physicians and perhaps a few allied health care personnel. There would be little need for increasing the output of environmentalists, health educators, medical care administrators, epidemiologists, public health nutritionists, and so forth except to fill existing shortages.

If the assumpiton, on the other hand, was that we would encourage the pattern of health care delivery to be along the lines of large comprehensive pre-payment practices, e.g., Kaiser, then California would need to produce different mixes of health care personnel - fewer physicians, more nurse practitioners, and other allied health care personnel, and certainly additional health care administrators, educators, epidemiologists, etc.

If we move to the so-called "socialist" model, the mix of personnel and resources changes again, in the direction of fewer traditionally trained M.D.'s and increasingly larger numbers of allied health personnel and public health trained professionals.

It is difficult to be precise when asked the question, "What impact does prevention have on sick care?" Answers are equally imprecise when the question is, "What impact does sickness care have on health?"

History is replete with evidence that prevention can impact health in dramatic and, most importantly, in lasting ways. There is little controversy remaining that flouridation will decrease tooth decay by upwards of 60%, nor that reducing cigarette consumption will lower cancer and cardiovascular disease mortality. The latter example is extremely important since we have entered an era in which the behavior patterns of the individual are the most important factor in his medical history. A lot more lives would be prolonged by learning how to live with stress than by having heart transplants.

Perhaps an example will help to focus the point I am trying to make. Let's take the problem of high mortality resulting from traumatic injury in automobile accidents. If we take the sick care model and the small practice mode of delivery, we would recommend that we train enough emergency care M.D.'s to staff emergency rooms in hospitals located along major highways. We would need to train ancillary emergency room personnel, the numbers depending on the number and location of the emergency rooms. If we took the sick care model but a large emergency delivery mode, we might significantly reduce the number of emergency rooms, emergency physicians and allied health personnel required by putting resources into airlifting victims to fewer centrally located emergency centers, such as is done in warfare. If we took a preventive model, we would determine that speed is the prime determinant of the severity of injury, reduce the speed limit and hire a few highway patrolmen to enforce the law.

The point is simply that when trying to predict the need for health care personnel and the need for expansion of the health science programs, critical and sustained study needs to be given to a full exposition of the assumptions under which we are operating, and to exhaustive discussions of alternative methods of delivering the services that those assumptions dictate. A State policy to provide the assumptions of choice for California is therefore strongly urged.

2. OUR ASSIGNMENT

The California Postsecondary Education Commission, in cooperation with and using the staff and abilities of the Department of Health Manpower Unit, and utilizing the appropriate personnel of the University of California, will provide the Legislature and the Governor with a report by April 1976, on the needs for various categories of health personnel in California (including physicians, mid-level medical practitioners, nurses, pharmacists, dentists and optometrists) and recommended targets for expansion of health sciences programs in California. The report should provide consideration of the following:

1. The likely impact of National Health Insurance on the need for categories of personnel;
2. The likely migration patterns of health personnel to and from California;
3. The needs for particular specialists within categories of personnel;
4. The substitutability of mid-level practitioners for physicians and dentists.
5. The need for additional State-funded programs to train the personnel required;
6. The appropriate location of clinical training programs to meet public policy objectives of decentralization, to benefit regions in the State, to attract practitioners to underserved areas, and to utilize existing clinical resources;
7. The adequacy of educational opportunities for Californians in the health sciences; and
8. Recommended enrollment totals, taking into account need for personnel and educational opportunity issues.

3. APPROACH OF THE STUDY

A report of this scope and magnitude could not be written in six months without a great deal of professional advice, consultation, and assistance from individual experts in various areas of health manpower and education. Certainly there was no time for on-the-job training for anyone associated with this study.

The study is designed to:

1. Examine some of the important occurances in national legislation that potentially may change the demand for health services in California. The assignment specifically asked for information on National Health Insurance. We have expanded this to include two other issues as well:
    a. National Health Manpower Legislation, and
    b. Professional Liability Insurance Premium Increases,

which may affect the future supply of health manpower in the State.

2. Translate the potential increase in demand for health services to the demand for health manpower in five major areas (M.D.,D.D.S., etc.) by examining the supply of health manpower from the State's educational programs, the migration issues, and the substitutability of mid-level practitioners.
3. Examine the educational opprotunity issue in regard to health sciences educational programs and consider their adequacy.

Five health professional associations were contacted to assist in providing data, information and papers for the study as well as giving the professional points of view. Contact persons or small committees from each organization worked closely with us.

Educators in each of the fields were also contacted.

Individual experts in each of the following areas were engaged as associate consultants to assist in the examination of:

1. Health Policy and Legislation
2. Supply and Demand Projections
3. Migration and Specialty Issues
4. Mid-level Substitutability
5. Educational Opportunities

These individuals gave a broader scope to the study across occupational lines with their input.

To further expand the involvement of persons in the study, 400 individuals with backgrounds in health planning, health manpower planning, health manpower education, health legislation, employment of health manpower, third-part payment, health professions, and consumer interests were invited to attend the California Health Manpower Forum on December 5, 1975. They discussed material generated for the study up to that point (2 months into the study). Many useful comments were heard at the Forum. In addition, written comments were received from 45 of the participants at a later date. A separate Forum report has been prepared.

Finally, a steering committee was established to provide advice on the study. This committee consisted of representatives of the State Legislature, public and private schools and institutions, and other state agencies concerned with health sciences. The eight members of the committee offered much advice and guidance.

4. METHODOLOGY

A major program objective of the Division of Manpower Intelligence of the Bureau of Health Resources Development of the National Institute of Health during the 2½ years of its existence, was the analysis of current and future health manpower resources and requirements.

An Inventory of Health Manpower Models and An Analysis of Health Manpower Models were published as the result of their effort to develop improved techniques and analytical tools in prusuit of the above objectives. A detailed description of the 56 health manpower models was evaluated in depth. The usefulness of the models were evaluated in terms of applicability, generality, validity, and operational feasibility. These manpower models were assessed individually by the Health Manpower Study Office before final selection of the current methodology was made.

One of the considerations related to the available data. Data were sought from national and state professional organizations, licensing boards, publications, university administrations, and state and federal agencies. An overview of this effort revealed the following deficiencies:

1. the same kinds of data are not collected for all health professions;
2. data collected or analyzed from year to year and even month to month are not compatible because of a lack of uniformity in format;
3. different dates are used by different occupations for collecting data;
4. reliability of some data is questionable; large discrepencies often occur between two sets of data received from two different agencies, or even data received at two different times from the same agency; and
5. Several needed data for utilizing certain models were not available at all.

The limitation of data affects the selection of models for analysis.

Acting as a consultant to the Health Manpower Study Office, INTERPLAN, Inc. of Santa Barbara, developed and applied methodology for projecting the future supply and migration patterns for five health personnel categories: registered nurses, optometrists, pharmacists, physicians and dentists.

The results of the projections and analyses based on this methodology include base case projections for each category and analysis of the sensitivity of these projections to changes in the factors influencing future supply. Summaries of the base case analyses and sensitivity analyses are presented in Appendix D. Also included are detailed descriptions of the methodology, assumptions and data used in the base case projections. Appendix D also contains summary tables and copies of the computer printouts of each of the sensitivity analyses performed with a computerized version of the models. Appendix D consists of several sections that were written as self-contained units to facilitate their incorporation into the final report. For this reason, the reader will find a certain degree of repetition in the narrative of the individual sections of this report.

Projection Methodology Overview

The general methodological approach used to project future supply for each of the manpower categories considered in this report is to estimate additions to the current supply of trained health personnel from the expected flow of new graduates and to estimate losses from death and retirements. The sum of these two factors produce the net increase in total supply.

In applying this method, explicit allowance has been made for both out-migration of California graduates and the in-migration of graduates trained outside the State, as well as for the rate of growth of output of graduates both in the State and outside the State. In applying these concepts, a computerized version of specific models in each of the five categories of health personnel and projections were made recursively for each year from 1975 to 1990. The model used for each of the categories is described in detail in Appendix D.

The resulting supply projections are made independent of any considerations of demand, need or want.* One exception is the base case dentist projection which was modified for demand considerations as described below. Thus the results must be viewed in the context of their preparation; namely, as one of a series of parallel analytical efforts. For organizational purposes, its was considered necessary and analytically feasible to consider supply and requirements independently.

Although it is possible to raise a number of valid considerations to support the position that the supply of manpower is largely unaffected by demand considerations in the short-term (i.e., that supply is inelastic in the short-run, however defined), the analysis of supply independent of demand was carried out mainly for administrative convenience. Only minor attention is given to major aspects of the influences of demand on supply. Other factors which may have a profound affect on future supply if they occur to a significant degree, such as changes in productivity, organizational changes, (e.g. Health Maintenance Organizations), new developments in health insurance, licensure review, and task delegation, to name but a few, are not specifically addressed, except through the sensitivity analyses.

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*The distinction between the need for medical services and demand is well recognized. Broadly speaking, "need" refers to medical services that professional experts have identified as necessary for good health; "wants" are those medical services that lay individuals desire; and, "demand" is the care individuals both desire and are willing and able to pay for.

Further, the methodology used does not consider the impact of any one manpower category on the supply of other related health personnel projections, such as the possible effect of a large increase in allied health manpower on the supply and need for other professional services or the impact of the projected number of trained professionals on future entry, migration or activity patterns (except as implied in the sensitivity analyses).

Migration and possible changes in migration patterns are, of course, of particular interest. Qualitative assessments of the impacts of key economic, sociological and policy-related factors play an important role in any comprehensive analyses of health manpower supply. However, the projections in this report are largely quantitative baseline projections predicated on the continuance of observed historic patterns. The results are intended to give a reference point for policy analysis and decision-making, and represent a point of departure rather than utlimate statements on future health manpower supply in California.

Data and Assumptions

Relative to the magnitude of the problem being addressed, the analysis for this report was conducted in a very short time period of about six months with limited resources. As a result, it was necessary to use only data readily available without embarking on any major effort to collect additional data or even refine the existing data set to any great extent. As a result, there are several cases where simplifying assumptions needed to be made. As an example, it was assumed in the base case projection for pharmacists that all California graduates took up practice in California. An attempt was made to explore and clarify the uncertainty implications of these simplifying assumptions with the sensitivity analysis. However, it will be clear to the careful reader that there are many important areas requiring further research.

Many of the simplifying assumptions were necessitated by incompatibilities, gaps or other limitations in the data available. However, the methodology provides a well-defined framework for specifying many of the key data elements of a data set needed for the future development of a comprehensive health manpower planning and evaluation methodology.

1. SUMMARIES AND RECOMMENDATIONS

A. SUMMARIES

1. THE IMPACT OF FEDERAL HEALTH MANPOWER LEGISLATION

In attempting to determine the impact of pending federal health manpower legislation on the state of California, it must be kept in mind that the law which is finally enacted will not become effective until 1977, at the earliest. The length of time required to implement its mandates will vary according to the specific provisions, thus possibly delaying their full impact until the 1980's. The impact of those provisions which focus on medical students newly enrolled after enactment of the legislation will be even further delayed by the length of the physician training process.

Decisions on capitation payments are likely to have the most immediate effect on the medical schools. It seems clear that capitation funds will continue to be available to medical schools, but the amount per student could be reduced and the requirements for receiving the payments will address very different issues than in the past. In order to receive capitation payments under the new legislation, medical schools will be required to shift their focus from increasing enrollments to actions which seek to alleviate problems of geographic and specialty maldistribution.

A reduction in the amount of capitation payments will have a more profound impact on private medical schools in California which cannot rely on State funding. Both State and private institutions may feel compelled to compensate for a reduction in capitation payments by increasing tuition. Being part of the State-supported educational system, the public medical schools in California will be able to absorb a greater reduction in capitation payments than their private counterparts in the State before having to resort to tuition increases.

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The various bills currently before the Congress differ in the extent to which they use capitation payments to achieve federal objectives. There are some proposed stipulations--such as the requirement that each student agree to provide service in an underserved area in order for the school to receive capitation funds--which the medical schools in California may find unpalatable. If such requirements were enacted into law, the medical schools in California might refuse to comply and thus sacrifice all capitation funding. In this instance, it is reasonable to assume that all schools, public and private, would be forced to increase tuition. It is likely that those provisions perceived to be the most severe or an encroachment on a school's academic freedom will not appear in the legislation which emerges from Congress; but it is still too early to predict the outcome.

The emphasis on enrollment increases which existed in federal health manpower legislation since 1968 and was encouraged through capitation payments in the 1971 legislation, has been greatly diminished in the currently pending bills. The Congress has come to recognize that increasing the supply of health professionals does not guarantee improvement in their distribution, either geographically or by specialty. Many have reached the conclusion that the nation now has an adequate or even excessive supply of physicians and that all efforts should be concentrated on redistribution to improve the availability of their services.

With respect to enrollment increases, alternative requirements in the current bills range from maintenance of enrollment to only modest increases. In the short term, neither provision will have a significant impact on California. A problem could arise in the future, however, as a result of California's reliance on physician migration from other states for a substantial portion of its physicians. If states which have been losing their medical school graduates to other states, such as to California, develop new networks of educational programs focused on retaining their graduates, the number of physicians migrating to California in the future may diminish.

It is reasonable to assume that no matter which bill is enacted, it will incorporate a requirement that at least 50% of a school's affiliated residency positions be in the primary care specialties of internal medicine, general and family practice, pediatrics and perhaps obstetrics and gynecology. The provision is likely to allow three years in which to phase in the full number of primary care positions. The proportion of all residency positions in the United States represented by internal medicine, general and family practice and pediatrics in 1973 was 38%. The state of California had only a slightly higher proportion of its residents in the primary care specialties, thus requiring roughly a 6 to 10% increase in the number of first-year primary care residency positions by 1980 to meet the legislative mandate.

A major impact of this provision on all schools will be the need to expand their ambulatory training capacity to accommodate the increased numbers of primary care residents. Such expansion can take a variety of forms in addition to increasing currently existing capacity within teaching institutions. In California, this might encourage decentralization to those areas where facilities exist which have the capacity to participate in graduate training programs. For those teaching hospitals which are located in inner city neighborhoods, the possibility of expanding ambulatory training capacity through neighborhood clinics could improve the availability of services to inner city populations while at the same time meeting the ambulatory training needs of the teaching programs. Moreover, such a program of training and service would respond to legislative mandates for improving access to care for underserved populations.

The ultimate impact of the various federal health manpower policies currently being proposed in Congress may not be felt for a decade on the state level. The federal government can mandate and provide financial support--two vital components in policy development and implementation--but the style of the programs will depend heavily on how policies are interpreted and implemented at the state level. It is therefore necessary for the state of California to be aware of federal policies which will affect the supply, distribution and practice patterns of its health professionals and to be active in translating federal policy into action within the state context.

As of March 17, 1976, the Senate Subcommittee had postponed its scheduled mark-up of the Health Manpower Act until March 22. The Subcommittee originally planned to work from the House-passed version of the legislation, HR 5546. The delay was said to be due to a general Congressional slowdown following the death of the House's most senior member, Representative Wright Patman (D-Texas), according to a Subcommittee staffer.

2. THE EFFECT OF PROFESSIONAL LIABILITY PREMIUM RATE INCREASES ON PATTERNS OF PHYSICIAN PRACTICE IN CALIFORNIA

Approach

This Administrative Report briefly summarizes the preliminary results of work done by Rand during the past three months for the California Postsecondary Education Commission on the effects of professional liability premium rate increases on patterns of physician practice in California.

Our research has included the following tasks:

--Review of recent literature on medical malpractice, including federal and state reports and hearings as well as periodical literature.

--A letter and telephone survey of medical and specialty societies in California, concentrating primarily on northern California, to determine the effects of malpractice increases. As of this writing some response has been received from almost all northern California medical societies.

--Analysis of sample surveys of physician practice patterns conducted by (1) the Office of the State Auditor General (referred to hereafter as Auditor General's Survey) during August; (2) the California Medical Association in December (to be published and referred to hereafter as CMA Survey); (3) the Department of Health, and (4) Johnson and Higgins insurance brokers.

--Compilation and preliminary analysis of data from insurance brokers on changes in premium class by physicians which would tend to reflect changes in practice patterns.

--Compilation and analysis of data from the Board of Medical Quality Assurance on licensed physicians in California.

--Compilation and analysis of data on trends in hospital occupancy before, during and after the physician slowdown in the San Francisco Bay area.

--Compilation and preliminary analysis of data provided by the State Health Department and Medi-Cal fiscal intermediaries on physician provider participation and on trends in use of physician services.

--Preliminary analysis of data compiled by the Health Manpower Development section of the Health department on practice choice of Family Practice residents.

--Compilation and preliminary analysis of data on malpractice premium rates and suggested rates in various states.

Limitations

This report presents preliminary findings and tentative conclusions which will be subjected to further analysis, refinements and revision. It has the following limitations:

1. Rate changes have occurred only recently and it is too early to get a comprehensive statewide picture of their effects.

2. Much of the information we have gathered is from surveys of physicians, medical societies and specialty groups taken during a time of controversy and may, to some extent, reflect the emotionalism of the moment and only temporary attitudes and practice changes.

3. Certain changes in physician behavior may be apparent only after more time has elapsed (e.g., changes in practice location choice).

4. Data concerning the effects of these changes is only now becoming available and is fragmentary.

5. We have not completed our analysis of data only recently made available.

To surmount some of these limitations we have focused attention on examining effects of rate increases in northern California where rate increases occurred first. We have also tended to regard survey responses of physicians in some instances as a likely upper-bound indicator of their actions. Thus, we present early evidence of changes which must be monitored and viewed more comprehensively before more mature conclusions about the full statewide impact of malpractice rate changes can be known.

Conclusions

Our preliminary analysis, based upon statewide surveys focused primarily on northern California data, suggests that major increases in malpractice rates have:

1. not yet caused a major movement of physicians out of California;

2. not yet caused reductions in the annual number of new physicians licensed to practice in the State;

3. not yet caused reductions in the number of out-of-state licensees;

4. not yet caused an increase in the number of endorsements by California physicians to practice elsewhere;

5. not yet resulted in encouraging graduating California family practice residents to leave California and set up practice elsewhere;

6. not significantly reduced physician willingness to utilize physicians' assistants;

7. not yet resulted in significantly reducing the number of physician providers serving Medi-Cal patients up through November 1975;

8. not resulted in significantly reducing the availability of physician care to Medi-Cal patients in San Francisco and the East Bay after the May physician slowdown;

9. apparently not resulted in discriminatory treatment by Bay Area

physicians of Medi-Cal patients needing hospital care during the May physicians' slowdown;

10. probably encouraged premature retirement of a few, but not an overwhelmingly large number of older physicians -- many of whom may have been practicing part time;

11. probably significantly affected the spectrum of services provided, particularly by family practitioners, many of whom indicate they have reduced surgery and obstetrics and by other specialists who appear to have reduced surgery;

12. caused frustration among family practice residents who are discouraged from performing obstetrics and other procedures for which they received residency training;

13. probably reduced the availability of care in certain rural areas, particularly obstetric care and services to Medi-Cal patients;

14. resulted in increased expression by physicians of their unwillingness to accept new Medi-Cal patients and reports by medical societies and public officials that few physicians in many northern California areas are accepting Medi-Cal patients without referrals.

15. potentially improved quality of care to the extent that unnecessary surgery is reduced and less technically competent physicians are discouraged from performing surgical procedures in poor facilities;

16. resulted in increased costs of service ranging from 10 to 30 percent for office visits to primary care physicians and more for surgery and specialty care. Most physicians appear to be passing all or part of their increased premium costs on to private patients;

17. encouraged a small but significant number of physicians to practice without insurance (probably between 5 and 10 percent);

18. probably in metropolitan areas stimulated a transfer of certain patients from family physicians to surgeons and obstetricians;

19. caused many physicians who have not made changes in their practice to consider doing so if rates continue to climb;

20. probably, to a minor degree, helped increase the attractiveness of closed practice settings although salary increases were probably a more important incentive to those moving to military service than the disincentive of higher premiums,

In sum, available evidence suggests that malpractice rate increases have not yet caused significant reduction in California physician supply, but appear to have spurred changes in practice patterns with potentially important effects on the availability, cost and quality of care, particularly in non-metropolitan areas. These effects should be carefully monitored so that their impact statewide and in particular areas of California can be appropriately assessed by policymakers.

3. THE IMPACT OF NATIONAL HEALTH INSURANCE ON HEALTH MANPOWER IN CALIFORNIA

No major new Federal financing program for medical care services is likely to be fully implemented within the next five years. Congressional interest has waned since the Kennedy-Mills proposal came close to passing in 1974. New members of the relevant committees are still developing a basic grasp of the issues and options. The budgetary situation is unfavorable with respect to both general fund financing and the use of the Social Security Payroll tax. President Ford has responded to the potential of continued large budget deficits with a fiscal policy whose expenditure level does not allow for new programs of the magnitude of National Health Insurance.

Once National Health Insurance is looked at seriously again, the Congress will require two sessions to complete hearings, prepare legislation, and to enact the final, compromise plan. Two to three years will then be required to develop the administrative machinery to carry out the legislation. There is plenty of time for the State legislature to formulate a well planned health manpower policy in response to National Health Insurance.

Many basic issues must be faced in defining National Health Insurance proposals. There are four of those issues which will be of particular importance to the determination of manpower policies. They are (1) the service to be covered; (2) the extent to which patients share in costs; (3) who is eligible to be paid for providing medical care services and the mechanisms by which providers are reimbursed for services provided; and (4) controls over aggregate expenditures.

We haved divided the potential forms of National Health Insurance into three classes. Those are insurance against catastrophic medical expense, moderate programs administered through private insurance carriers with extensive use of co-payment and deductible provisions, and extensive federally financed programs which eliminate co-insurance for most services. A catastrophic plan would not effect the demand for medical care services enough to require a response from state health manpower policy. The impact would mainly be on tertiary care where the supply of resources in the State is adequate. However, the impact of the other two programs depends on the responsiveness of real consumer demands to changes in finance and on the capacity of currently projected professional manpower to meet those demands.

Projecting demand for physician services under alternative National Health Insurance schemes requires determination of how utilization will be altered by currently active consumers and increased for underutilizers of services. Among the most important factors influencing the change in demand for physicians; services are:

--the proportion of the population covered by insurance and government programs;

--the scope of services covered by insurance and government programs;

--the extent to which co-insurance and deductibles are utilized to constrain demand;

--the response of consumers to the change in price for a given health care service.

Although a slightly smaller proportion of Californians under age 65 were covered by private health insurance in 1973 than persons in the United States as a whole, the Medicaid program in California was wider coverage and greater benefits than programs in most other states. Therefore, the impact on demand in California is likely to be less than that for the entire nation. The greatest room for expansion in demand exists for the coverage of ambulatory physician care and specialized medical services such as dental care, prescription drugs, optometric services, and mental health services. There is considrable disagreement among analysts with respect to the extent users of health will desire to increase their utilization when faced with reduction in the out-of-pocket payments they must make for that use.

Although we cannot currently project with certainty the magnitude of change in demand for services under National Health Insurance, it is certain that such a program will further increase demand for services. Whether this increase in demand must be translated into a need for additional physicians depends in part on the size of the already projected supply and in part on the ability of physicians and other health care personnel to expand services. The nationwide increase in medical school enrollments since 1970 has led to a DHEW projection of an 84% increase in the number of physicians in the United States between 1975 and 1990. Under the assumption that California would maintain its present proportion of the national physician supply, its physician to population ratio would increase from 194 in 1970 to 230 in 1990. In addition to the increase in numbers, there is evidence that physicians in California could expand the number of office visits they average each week.

Six categories of assumptions are required in order to estimate the number of physicians needed to meet the utilization patterns expected in the future. They are:

1. The total population and its age distribution.
2. The current utilization of physician services (expressed in terms of office visits), in the aggregate and by specialty.
3. The change in demand for physician services that would be brought about by National Health Insurance.
4. The number of physicians in the future and their distribution among specialties.

5. The annual number of patient visits by specialty.

6. The role of nurse practitioners and physicians' assistants in meeting the expanded demand for services.

A series of specific assumptions within those six broad categories provided the basis for projections of the impact of National Health Insurance on the need for primary care physicians. Had we used a different set of assumptions the results might have been far different. It is important to consider our results in the light of the assumptions that we made.

Based on our analyses, we have reached the following conclusions with respect to the potential impact of National Health Insurance.

1. A moderate level expansion of Federal financing, which would primarily impact on the demand for ambulatory care, is not likely to require manpower for most regions of the State beyond that which is likely to be available. Substantial increases in physician manpower are already projected over the next ten years and there is evidence that many physicians in California currently have relatively low numbers of patient visits each week compared to the national average.

It must be noted that the difficulties which already exist in some areas of the State with respect to the lack of enough primary care physicians are likely to be increased with the passage of even a moderate National Health Insurance plan. However, the likely expansion of the National Health Service Corps might provide physicians and other health care personnel for a limited number of rural areas.

2. It is evident that NHI will aggravate the already existing need for a relative increase in those physicians who provide primary care to adults. We are not convinced that the apparent tightness in the capacity of those physicians to provide services relative to the demand

should lead to an expansion in the total number of physicians. Rather, we feel that *a major shift in the content and focus of graduate training, combined with the increased use of all levels of other health care personnel, likely will be adequate to meet the additional desired utilization.* Particularly important, at this time, is the need to expand and strengthen family practice training programs, to provide internists and pediatricians in training with more experience in primary care, and to improve the coordination of nurse practitioner and primary care physician training.

3. In general, it would seem that the impact on demand would be somewhat less in California than in the rest of the United States. This would particularly be true with a plan such as Long-Ribicoff which emphasizes catastrophic coverage with large deductibles and an improved Medical Assistance program for low income families. The Health Security Act pays a great deal of attention to the equalization of expenditure among geographical areas over time through allocations of the National Health Budget. Certainly, a large proportion of the increased expenditures induced by the plan would be allocated to those areas with relative shortages in resource supply and with low current levels of expenditures.

As noted above, National Health Insurance would likely reduce the inequality in purchasing power among the various states. Providers would face a considerably different market for their services. There is evidence that, in the past, physicians have located where there is high personal income per capita which could be associated with a greater demand for medical care services. California has been one of the beneficiaries of those behavior patterns. Some of its advantage in attracting medical care personnel may be reduced when a comprehensive National Health Insurance plan is implemented.

4. There is tremendous uncertainty in the projection of future health manpower requirements. To a great extent this is due to inadequacies in the data. Information on the numbers of physicians, their specialty focus and actual practice, and on the residency training programs is controlled by the medical profession. We believe it is imperative that the Federal government and State governments gather the information they require to adequately understand the present and plan for the future.

At the same time, we must face the fact that the best of data will not provide precise answers to the relevant questions. Measurement is difficult, behavior patterns are hard to measure, and the future does not exactly replicate the present or the past. Therefore, mechanisms must be developed to monitor the status of the system on a continuing basis to facilitate a more rational response to shortages or excesses as they become apparent.

5. Finally, we want to emphasize that there are social costs involved with either an oversupply or undersupply of physicians. To the extent that physicians control the use of their services, the potential for the excessive use and dependence on medical care exists. Faced with the uncertainty mentioned before, the state government must balance the potential for error on both sides.

4. MEDICINE

As of October 1975, there were 107 U.S. medical schools approved to award the Medical Degree. There were 54,074 medical students enrolled in the 114 medical schools in the United States in 1974-75. The first-year class numbered 14,963 which is an increase of 5.2% over the previous year. Nationally, there has been a 69% increase in the first year medical school enrollment and a 72% increase in the number of M.D.'s awarded in the United States in the past ten years.

In California we presently have eight accredited medical schools (five public and three private). In addition, there is the Charles R. Drew Postgraduate Medical School offering only residency training and continuing education programs for physicians.

In 1972, the Berkeley campus of the University of California initiated a new program in medical education to be operated jointly with the School of Medicine at San Francisco with a strong emphasis on primary care and utilization of community resources. In 1974, the Riverside campus of the University of California, in conjunction with the University of California at Los Angeles, developed a new biomedical science program which will begin to enroll 24 students by 1977 at the medical school campus in Los Angeles.

Planning has also been initiated between the UCSF Medical School and the Fresno Veterans Administration Hospital for a new medical education component in the northern San Joaquin Valley with a planned enrollment of 6 third-year students and 94 interns and residents in 1976.

Total California M.D. degrees awarded went from 463 in 1965 - 1966 to 899 in 1974 - 1975 which is an increase of 92% contrasted with a 72% increase nationally. In the same period, the California population growth averaged only a little less than 2% per year. Despite this rapid growth, California in 1975 contributed only 5.9% of the total M.D. graduates in the nation.

Only 28.6% of the 1975 active non-federal physicians in California received their educations in California. Sixty and six-tenths percent of the California physicians graduated from medical schools in other states and approximately 10.9% were trained in foreign medical schools; 56.5% of all California graduates attended private medical schools in the State. Of the 1975 graduates, 67.2% chose to remain in California, and 54.2% of the graduates are currently interning in the State.

California may not be able to continue to depend on in-migration from other states, however. Many states have become conscious of their loss of highly trained manpower to our state and are seeking ways through incentive programs, mandatory service legislation and other strategies to retain graduates within their own medical undereserved areas. A review of the factors which may change migration patterns of physicians is presented in a later chapter.

The maldistribution of physicians is significant in urban counties. San Francisco County with 3.2% of the State population has 8% of the total physician population; Los Angeles has 32.7% of the State population with 35% of the physicians. Some of the rural counties, however, have a much lower ration of physicians/100,000 civilian population.

Although the state of California has a higher ratio of physicians than many other states, approximately 22% of the population of California is estimated to be in need of primary care services. The Health Manpower Policy Commission identified in 1975 seven census tracts in the downtown area of San Francisco County, seventy-five census tracts in Los Angeles County, sixteen census tracts in the city of San Diego, fourteen census tracts in the city of Oakland, and fifteen other rural counties as critical physician shortage areas.

To deal with the current physician manpower problems in California which include a relative shortage of primary care physicians, a relative shortage of physicians in some rural and low-income urban areas, and an oversupply of physicians performing surgery will require changes in federal health manpower policy, policies of the Coordinating Council on Medical Education, the liaison Committee on Graduate Medical Education, and the various specialty boards and societies involved in residency training as well as health manpower policies in California. In terms of manpower policies, the number and distribution of residency training positions is the key to future supply. It is the policy area which we address in the greatest detail in this report. Reimbursement policy under private health insurance, Medicare, and Medicaid is also important.

The problems of geographic and specialty maldistribution are interrelated for several reasons including the differnet practice location preferences of internists and other specialists as compared with general and family practitioners, the significant variance in the number of patients seen per day and per week by general practitioners and other primary care specialists, the declining number of general practitioners and the increased number of internists and pediatricians who will be prividing primary care in the future. In this report we examine the following issues both from the national perspective and in relation to California:

1. What is the problem?
2. The optimal distribution among specialists
3. Primary care and primary care specialists

4. Physician specialization in California

5. Specialization and physician location

6. Specialization, demand, and utilization

7. Residency training programs in California

8. The control of residency training

9. Choosing sites for training

Based on the analysis of this report, we have reached the following conclusions:

1. Policies of the federal government and migration patterns of physicians will have a greater impact on the total number of physicians in California and their distribution by specialty than state policies. The great majority of California's practicing physicians received their undergraduate medical education outside of California. More than one-third of American medical school graduates in the last decade who are practicing in California had none of their graduate training in California.

Federal legislation under consideration could have considerable impact on the state of California. However, it must be kept in mind that the law which is finally enacted would not become effective until 1977 at the earliest. The length of time required to implement its mandates will vary according to the specific provisions, thus possibly delaying the full impact until the 1980's. The impact of those provisions which focus on medical students newly enrolled after enactment of the legislation will be even further delayed by the length of the physician training process.

2. Our projections of the California specialty distribution for 1990, based on DHEW national projections, indicate that the growth of primary care physicians, while substantial, will remain considerably less than the growth in the surgical specialties and other medical specialties. There is no one

method available for determining the optimal distribution of physicians among specialties. However, we are willing to accept as a tentative objective the widely suggested criteria that 50% of all physicians should be in primary care specialties. As previously noted, the primary responsibility for changing this projected trend must fall to the federal government. However, the State can have important marginal impact through the direct subsidy of certain programs such as family practice and other primary care residencies. It seems to us that the trends in specialty training during the past four years and the failure of present voluntary mechanisms to effectively control the total number of residencies or create a balanced mix among training positions in primary care and other specialties is hardly a cause for optimism that the voluntary approach will succeed in the future.

3. The choice of sites for primary care training programs is a complex decision. Consideration must be given to the level of clinical training under discussion. Residents require a sophisticated education experience with a relatively large patient base and a wide disease spectrum. A detailed list of criteria is given in the chapter on medicine of this report

5. NURSING

Major Issues and Problems

There seems to be agreement from every research source that the health care system in the United States is changing and is facing increasing pressure to change. Technological and scientific medical advances, coupled with rising costs and expectations for comprehensive care are making demands on the traditional health care system which it cannot meet in its present form.

It is in this context of the changing system that nursing education confronts two basic issues:

1) What kinds of demands for services must nursing be prepared to meet?

2) In what ways must the supply of nurses be adjusted in order to meet the new health/nursing care needs?

Summary of Identified Problems

In examining the data of the supply of nurses and their utilization at present and the projections of nurse supply and demand in the next 15 years, a number of complex concerns are identified. The data analyzed in this report brings up many problems and questions which need to be answered. The following is a summary of these problems and questions posed by the data. Thus the summary of findings of this report includes the questions to be answered by the recommendations:

a) Should nursing training programs be expanded and should new ones be developed? Demand and supply projections indicate a need for more nurses, and statistics show that California is now and is likely to remain a debtor state. Yet it is found that there is difficulty for many nurses to find employment in California.

Should there then actually be imposed a moratorium on new training programs or even a cutback of nurses trained in California?

b) What can or should be done about the high attrition rate among trained nurses and the low labor force participation of experienced nursing personnel?

c) What can or should be done about the large number of health science program applicants for whom there is no space?

d) Is more clinical training needed by academically trained nurses as nurse employers indicate? What kind of clinical training is needed by emerging nurse professionals?

e) Is the fair representation of ethnic minorities in California in 1975 in nursing education also reflected in the employment of nurses? What about equal opportunity for males in nursing education?

f) How can working nurses upgrade their status professionally and academically when required continuing education does not constitute this upgrading?

g) Can and should nursing education units and clinical functions be standardized? Will standardization aid in the articulation between various levels of nursing education programs?

h) Should emerging nurse roles be articulated with present nursing education levels to create a specific career ladder for nurses?

i) Should the same assumptions regarding allocation of time be made of nursing educators as it is of medical faculty (including time for research activites, community and professional service,

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6. DENTISTRY

California has five of the 58 schools of dentistry in the United States; the University of California at San Francisco (UCSF), the University of the Pacific (UOP), the University of California at Los Angeles (UCLA), the University of Southern California (USC), and Loma Linda University. These five schools enroll about 544 first-year dental students. No other state in the nation has this many dental schools and no other state enrolls as many first-year dental students. However, only 32.5% or 177 of the 544 first-year places are in state-supported schools. In 1975, 80% of the first-year places were occupied by California residents. With the current pattern of enrollment, it is likely that the number of graduates for each year during the next several years will be about 500 to 510 per year.

In a 1975 analysis of active non-federal dentists, it was established that approximately 62% had been trained in the state of California. The largest migration of dentists was from Illinois and Missouri with 7.3% and 4% respectively of California's dentists having been trained in those two states. The average age of dentists was quite young in 1975, at 43 years of age. The California Dental Association estimated that the number of dentists lost due to death, retirement or other factors would be about 3% per year.

At the present time, distribution of dentists in California is quite good, with only one rural county lacking at least one resident, licensed dentist as of 1975. There are still some population groups who do not have access to dental care for a variety of reasons--financial, cultural, and educational barriers prevent these groups from receiving adequate care. In 1973, a survey conducted by the California Dental Association (CDA) reported that only 5% of all dentists felt that they were too busy and would like fewer patients. Forty and three-tenths percent indicated that they were not busy enough and needed more patients. The majority of dentists also reported that they could accept almost all new patients. The findings of this survey indicate that increased productivity of dental manpower is possible, and could absorb a sizeable increase in demand should one occur. These findings should be of particular interest to those who are planning expansion of publicly-funded dental care services. It is anticipated that little or no dental care will be included under a national health insurance plan by 1980, and that the incremental increase of prepaid dental care programs currently occurring in California will place no undue stress on the dental manpower supply.

Dentistry is currently in a state of flux concerning the realignment of duties for dental auxiliaries. Recent legislation (AB 1455) and new regulations, which have yet to be implemented, have provided for a career ladder concept which expands the duties legally delegable to auxiliaries. The impact of this recent legislation has yet to be determined; although research in clinical settings has indicated that a substantial increase in productivity might result from utilization of expanded-duties auxiliaries.

No research has been conducted specifically to determine the optimal number of dentists for each specialty area who will be required to meet the demand and need for dental services in California. The CDA study showed that, on the whole, specialists are less busy than general practitioners. It can be concluded, then, that there are currently sufficient numbers of specialist dentists in the State to meet the demand and that it is not necessary to make a special effort to increase their numbers.

The State can expect even more recent manpower data to result from a survey to be conducted by the Board of Dental Examiners in March of 1976 as a part of the licensing renewal activities for all dentists and dental hygienists in California. The results of that survey in terms of distribution and other significant manpower information should be of great help to future planners. It is our understanding that such a survey will be part of each subsequent two-year license renewal.

7. PHARMACY

California has three of the seventy-two schools of pharmacy in the United States; the University of California at San Francisco (UCSF), the University of the Pacific (UOP), and the University of Southern California (USC). These three schools awarded 417 pharmacy degrees (or 5.8% of the national total) in the academic year 1974-75. Between 1966 and 1970, there was an increase of about 87% in the pharmacy degrees awarded by these three California schools. By the academic year 1976-77, the three schools should be graduating a combined total of about 450 pharmacy students.

In a 1973 analysis of active California pharmacists, it was established that approximately 54% had been trained in other than California schools. In addition, the enrollment in the three California schools of is predominantly California residents (the 1975-76 entering class was only 8% out of state or out of country). The same 1973 study showed that the average age of California pharmacists was quite young, that is 41 years of age; and the average work week was 45 hours. Generally, these data suggest a favorable supply of pharmacists in the near future.

It is difficult to project future demand for pharmacist services in the United States or California. There is no general consensus as to what reasonable pharmacist-per-population ratio should be sought. At the present time, distribution of pharmacists in California is quite good, witho only one rural county not having at least one resident licensed pharmacist in 1975. This distribution of pharmacy practice is apparently a function of consumer demand, since about 75% of the California pharmacists are working in a community-based (independent or chain) pharmacy setting. If, however, a national health insurance program is instituted the increase in prescription drug consumption is estimated at 6% to 26% and this could significantly impact upon pharmacist manpower needs.

There are several major issues which relate to projecting future pharmacy manpower and recommended educational enrollments for California. These are briefly outlined below:

a. Uncertainty regarding whether pharmacists are underutilized. Eighty-five percent of the pharmacists in California reported spending some time in dispensing prescriptions and 69% spend over half of their time in this function. This issue relates to whether the highly educated professional pharmacist might not be more effectively and efficiently used in more extended roles, particularly clinically oriented ones. There appears to be insufficient information regarding the impact of using the pharmacist in an extended role upon the efficacy of the pharmacy and overall health care delivery system.

b. Insufficient information with respect to the desirability and appropriateness of training pharmacy technicians to perform specified reallocated tasks of pharmacists in the preparation and distribution of medications under the supervision of pharmacists. At the present time, there is only one experimental project in California which relates to training of pharmacy technicians located ath the USC County Medical Center.

c. Uncertainty regarding the future of clinical pharmacy in the pharmacy profession. The Report of the Study Commission on Pharmacy, 1975 which was commissioned by the American Association of Colleges of Pharmacy, indicated that the future role of clinical pharmacists in various health settings is unclear, and even admitted that no consensus presently exists for the definition of this professional specialist. A rapid shift to the training of clinical pharmacists who serve essentially in new roles might create pharmacy position openings in traditional dispensing roles. Unless of course, certain traditional pharmacist responsibilities were shifted to technicians. It would seem appropriate for the California schools, with their large Doctor of Pharmacy programs, to provide research and experimentation leading to clarification of the clinical pharmacist's role.

Also, if comprehensive health services continue to become more organized and institutionalized in the U.S., and there is a growing acceptance and demand for clinical pharmacists, California may experience an overall decrease in pharmacist supply. This decrease in pharmacist supply might occur as a result of California's presently training the largest proportion of the clinically oriented Doctor of Pharmacy students.

The major recommendations regarding pharmacy education for consideration by the Postsecondary Education Commission are:

a. the development of experimental health manpower training and retraining projects for extended role pharmacists and technicians in a variety of community and educational settings,

b. ongoing analyses of the impact of increased prescription drug consumption as a result of National Health Insurance on pharmacy manpower needs and incorporation of these analyses into the design for the experimental education projects in "a" above, and

c. no additional enrollments in the state-supported UCSF programs until definitive results are available from "a" and "b" above to develop definitive pharmacy education priorities for California.

8. OPTOMETRY

California has two of the twelve schools of optometry in the United States: the Southern California College of Optometry (SCCO) and the University of California School of Optometry, Berkeley (UCB). It is projected that by 1977, 989 optometrists per year will be graduated, of which 144 will be products of the two California optometry institutions. There has been almost a 100% increase in optometry graduates in California in the last 10 years.

California has a favorable inmigration of optometrists, averaging somewhere between 15 and 22 per year. Also the two schools of optometry in the State take in about 14% of the entering students in the country. UCB admits predominantly California students whereas SCCO is expected to gradually increase the proportion of out-of-state students in the next several years. Historically, according to the best information available, the graduates of the California schools of optometry tend to stay and practice in the State. The favorable inmigration factor is somewhat offset by the large number of optometrists who, because of their age, will be lost to the profession during the next 10 to 15 years due to attrition. In 1973 there were 645 active optometrists between the ages of 50 and 59, and 170 between the ages of 60 and 69. This grouping of optometrists in the older age bracket in California is quite similar to the national pattern.

Projections for optometry manpower needs are highly variable. In 1975 UCB and SCCO admitted a combined total of 160 students in optometry. Definitive estimates regarding the impact of a national health insurance program on optometry manpower demands are not available, although the California experience with Medicaid may be a useful index for this purpose.

There are several major issues which relate to projecting future optometric manpower needs and recommended enrollments for California. These briefly outlined below:

a. Uncertainty regarding the ideal optometrist/population ratio. This uncertainty is compounded by the overlapping of services provided by ophthalmologists and optometrists. Apparently ophthalmalogists provide some limited optometric services in California and California enjoys a relatively high ophthalmologist to population ratio. Estimates of the necessary ratio for optometrist/population range from 1/7,000 to 1/12,000.

b. There is inadequate information regarding the feasibility of training lower level personnel to assist the optometrist and thereby increase his patient capacity without affecting the quality of care. A national study of optometrists' attitudes regarding utilization of ancillary personnel proved to be very positive. A similar study of California optometrists' attitudes towards the use of paraoptometric technicians was also positive. Optometrists who had been in practice for less than five years projected that they could increase their practice capacity by about 30% through the utilization of trained technicians.

Merritt College in Oakland offers an accredited Optometric Assistant Program, three semesters in length in which students attend two evening classes a semester for three semesters. Each year 12 to 14 students graduate and they according to school sources, have all met with excellent success as concerns employment

Elsewhere in the country, there are 8 one-year programs designed to train paraoptometric personnel and approximately 17 two-year programs leading to an Associate degree.

It seems reasonable to assume that with the use of more optometrists in prepaid group practice settings or in government supported HMO's, that properly trained paraoptometric personnel could be utilized effectively and efficiently.

c. Uncertainty regarding the change in proportion of out-of-state vs. California student entrants at the SCCO. (There was a drop from 75% in 1970-71 to 23% Californians in the 1975-76 class). Projected enrollment figures for the 1976 SCCO entering class show only ten to twenty California resident students (less than 21% of a class of 96). The remainder of the training slots will be reserved for out-of-state contract students. Several states (e.g. Idaho and North Dakota) require one year of service within the home state for each year of the contract. Other states, such as Wyoming allow the student full freedom of choice in selection of their resident practice site. Should the trend toward greater selection of non-California students at the SCCO continue, it may seriously impact upon the State's optometric manpower situation. During a fifteen year period (1960-74), 79.4% of the SCCO graduates resided in California.

The major recommendations regarding optometry education for consideration by the Postsecondary Education Commission are:

a. the development of experimental training programs for optometric technicians,

b. the development of contingency planning for a state contract program with the SCCO or expansion of the UCB program,

c. no immediate increase in student enrollment at the state-supported UCB program unless and until national health insurance provisions for optometric services are instituted.

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9. HEALTH SCIENCES EDUCATION - THE NEXT DECADE

This chapter addresses problems and potential solutions in two major areas of health sciences education: needs of the health care delivery system that are amenable to change via the educational system, and needs of the educational system itself. System changes include improved practitioner attitudes toward primary care, and prevention of disease through patient and health education. The education needs include individualized pacing of instruction, modular organization of curricula, and modification of the continuing education process.

Changes are necessary and include public policy commitments (with requisite funding) to the needs described, and pilot experimental projects to develop modular curricula with alternate means of evaluating competence and granting credit.

B. RECOMMENDATIONS

1. GENERAL RECOMMENDATIONS

To insure the development of an effective and efficient health manpower system for California, we recommend the following:

1. The State Health Department be required to develop, expand, and modify the State Plan for Health by January 1, 1977 to establish specific goals, objectives and priorites, to identify geographical areas of need, to specify types and mixes of health services required to meet these objectives and to suggest the types of health manpower and nature of workers that would be necessary to carry out these functions. This plan should serve as a guideline for both educational institutions--as criteria for training health workers--and for health providers--as a guide for organizing and delivering health care.
2. The State Legislature mandate the Postsecondary Education Commission to establish an Advisory Committee by January 1, 1977 to recommend plans and policies for coordinating the training and utilization of health manpower. Such an advisory committee should consist of appropriate state agencies and officials and the public including representatives of health and educational institutions, finance, licensure boards, providers, regional health system agencies, and consumers.
3. The Postsecondary Education Commission be required to develop by June 30, 1977, plans and policies that will facilitate the coordination and functioning of the health delivery system and the institutions that train its workers. Such plans and policies should be developed with

inputs from the Advisory Committee and be focused toward accomplishing the objectives in the State Plan for Health. Specific policies and plans should include but not be limited to the following:

- identify the requirements of comprehensive care and the means for its delivery in various target population groups and geographical areas, particularly in areas of critical need and underserved areas;
- suggest the types of health manpower mix that will be required according to established health priorities and availability of workers, with particular attention given to overcoming barriers for the use of mid-level and expanded duty practitioners;
- propose an experimental educational system within existing schools and institutions that is based on learning units or modular curricula that allow students maximum accreditation and transferability, both horizontally and vertically in the health professions;
- develop guidelines for allocating faculty time in terms of percentage of time for instruction, research and community services;
- establish career ladders for continued training and advancement;
- plan for the retraining of workers and use of part-time employment positions.

4. A uniform and comprehensive statewide health manpower data system be established by July 1, 1977 to determine the trends and distribution of health manpower in the State and to forecast and update future needs

on a continuing basis. Such a system could be a joint effort of the Legislature, the Health Department, the Postsecondary Education Commission, Consumer Affairs, and federal data systems, but should be coordinated into a uniform, updatable, and compatible system to insure that collecting, analyzing, and reporting of health manpower data is useful in monitoring and forecasting manpower supply and demand. Specific functions of such a system should include but not be limited to the following:

- track factors such as employment rates, job turnover, vacancies, and minority hiring;
- predict future manpower requirements--i.e., areas where overtraining or undertraining exist;
- identify projected demands for health care services;
- determine cost benefits of alternative approaches of training and utilization of health workers;
- collect additional kinds of data suggested in this report--i.e., costs of liability and insurance rates, and determine their resultant effect.

5. Support the continuation and expansion of experimental and demonstration projects in health manpower training and utilization. The intent of such projects should include the following:
    - identify the functional roles and expanded duties of workers in such areas as pharmacy, optometry, nursing, and mental health;
    - identify the legal implications, appropriate work settings, supervision requirements and cost benefits of utilizing such personnel;

- develop career ladders and patterns of mobility in the training and employment of entry and mid-level workers;
- experiment with modular type curricula versus the traditional credit hour system and develop examinations to measure competence in skills and problems solving rather than knowledge tests;
- extend health services to rural and underserved areas through the use of nurse midwives and expanded duty training of other personnel;
- develop new or innovative methods to provide continuing education in remote areas where conventional resources are not available.

6. Create a uniform licensure system by January 1, 1978, with its objective being to provide the public consumers with competent health practitioners. Licensure should be based upon proficiency examinations and equivalency testing,and require continued education for relicensure. Such regulations should apply to all categories of occupations and workers.

Consideration should be given to the creation of a single personnel licensure system under a board or a department. Such an organizational unit or units should contain appropriate representation from the public, professional and subprofessional occupations and associations, educational institutions, and health providers.

Licensure renewal data should be uniform or be programmed to feed into the comprehensive data collecting system to report the number and location of active/inactive practitioners.

7. Increase consumer involvement in the advisory, planning and regulatory bodies concerning health manpower training and utilization. Consumers should be selected according to their type and numbers in order to make their contribution both representative and significant. Consumers should also be educated so that they can participate both intelligently and confidently in planning and advising along with more experienced or professional members of these bodies.

8. Appropriate funds to develop consumer-organized and directed health organizations for the purpose of health education, illness/disease prevention, and health maintenance. In the last analysis, the more responsibilty consumers assume in the prevention and maintenance of their own health the less demand they will place on the health care system and the less need for episodic and sick care. Examples of such organizations are the CommonHealth Club in Sonoma County, and other similar health maintenance organizations.

9. Provide incentives and subsidies to encourage the education and practice of needed categories of personnel. Examples of this could include the following:

   - provide incentives for primary care physicians by subsidizing their educations and residencies;
   - encourage practitioners to work in rural and underserved areas through tax breaks, group practice, giving special cultural and language training and other means;
   - identify rural areas that meet necessary criteria for training and establish sites for primary care training;
   - fund educational institutions according to priorites and needs for certain kinds of health workers.

2. RECOMMENDATIONS

PROFESSIONAL LIABILITY INSURANCE ISSUES

Many physicians appear to be riding out the initial malpractice storm, some having increased their fees to absorb increased costs and some having made practice changes to reduce them. Many are probably hoping for some legislative relief while they ponder their options for the future. If rates continue to rise substantially, then increased medical costs and perhaps more substantial practice changes will result.

Even though Medi-Cal recipients are obtaining access to care, it does appear that many physicians are becoming more reluctant to treat them due to increased disparity between fees charged to private patients and Medi-Cal reimbursement. Consideration should therefore be given to bringing Medi-Cal physician reimbursement more in line with charges paid to private patients. Efforts should also be made to assure that obstetric care is available to those in rural areas. In some areas increased use of nurse midwives could fill this need.

In addition, consideration should be given to making the rate structure more flexible to not discourage 1) rural and part-time practice by competent physicians; 2) family practice physicians and other specialists from doing those procedures they are trained and technically competent to do, and 3) new physicians from locating in California.

Recommendations for Further Research

We recommend that the following research be undertaken to more thoroughly document the effects of malpractice rate increases:

1. monitor trends in Medi-Cal physician provider participation and in their acceptance of new Medi-Cal patients to determine if shifts in availability and accessibility of care is occurring;

2. monitor trends in Medi-Cal patient census in county and community hospitals to determine if Medi-Cal patients are being increasingly admitted to county facilities;

3. monitor trends in selected surgical procedures and obstetrics by specialty and area to determine if changes in number of procedures or in type of physician performing these procedures is changing;

4. compile and analyze statewide data from malpractice insurance companies on the extent to which physicians are changing premium class and why;

5. collect and analyze data on selected surgical and obstetric procedures to determine if any reduction in number or change in physician specialty performing them;

6. analyze data from recent California physician relicensure and accompanying survey to determine changes in supply and distribution of physicians;

7. to the extent possible, complete and analyze data on residency location choices of interns and residents to determine if California is as attractive a place for location as it has been in the past;

8. survey California house officers to determine their practice choices and the extent to which malpractice may significantly influence that choice;

9. monitor malpractice rates in other states. Apparently no central repository exists for collecting rates by state;

10. develop a continuing survey of physician practice patterns on a sample basis to detect changes over time and on a timely basis.

3. RECOMMENDATIONS

MEDICINE

It is recommended that:

1. The state of California maintain on a continued basis a health manpower intelligence system that is responsible for collecting, collating and analyzing data and information required to monitor physician and other health manpower and health science education trends systematically. It is recommended that this be a joint effort between the California Postsecondary Education Commission, the Senate and Assembly Research Offices, the Health Manpower Unit of the State Department of Health, the regional health system agencies in the State, and the Department of Consumer Affairs.
2. Fund special programs for undergraduate medical schools to encourage medical students to enter primary care.
3. Based on the recommendations of the Health Manpower Advisory Committee, the Board of Medical Quality Assurance should certify the number of surgical specialties, family practice and other primary care specialty slots in State graduate medical programs.
4. Mandate the State Board of Medical Quality Assurance to develop a plan by 1977 in cooperation with the 14 health system agencies to assess the need for specialties in their area; and to issue limited licenses to out-of-state applicants to practice only according to openings available in local areas.
5. Provide greater support of family practice residencies and other primary care specialties such as the Song-Brown Family Physician Training Act (SB 1224).

6. The State should increase enrollment in the medical schools at the University of California by 72 in the entering classes for the next 4 years. In 1975-76, the first-year enrollment for the University of California's 5 five medical schools was 561. At this projected increase, the recommended entering class enrollment would be 633 by 1980.

   With these projected enrollments, our aggregate physician population will grow from 46,165 in 1975 to 54,732 in 1980; with a corresponding physician/population ratio increase from 201/100,000 to 222/100,000.

7. Require that medical schools allot at least 50% of their direct or affiliated filled residencies to primary care specialties, that is family practice, general internal medicine, and general pediatrics.

4. RECOMMENDATIONS

NURSING

The following recommendations regarding nursing education in California are presented here for consideration by the California Legislature. These recommendations are made as a result of compiling the various resources used as information in this report. All address problems discussed in this report are listed in the Introduction.

It is respectfully recommended that the California Postsecondary tion Commission sponsor the following activities in order to address problems detailed in this report:

1. Sponsor Comprehensive Studies of:
    a. Projected demand for generalized and specialized nursing care services including the following factors:
        - impact of development of prepaid health plans;
        - cost of such nursing services;
        - price for alternative services;
        - financial resources of training and employers facilities;
        - size of population and population growth factors, including income per capita;
        - statistics regarding facility usage where nurses are employed;
        - relationship between health care expenditures and GNP;
        - national trends and actions of the federal government and legislation which may have significant impact on nursing manpower demand in California.
    b. Costs and benefits of alternative approaches to providing continuing education and monitoring continuing education for

health professionals.

2. Support Systematic and Comprehensive Data Collection of:
   a. Nursing employment, job turnover, and other job availability factors;
   b. Percentage of employed minority nurses, minority nurse labor participation statistics and minority attrition rates;
   c. Legality of varius collaborative agreements and corporate structures between physicians and extended role nurses.
3. Develop Policy Statements and Actions on:
   a. Articulation between various levels of nursing programs considering credit transfer and achievement testing;
   b. Formalized career ladders between various levels of nursing training;
   c. Allocation of nursing program faculty time in terms of percentage of time for instruction, research and community professional services;
   d. Definition of roles of variously trained registered nurses;
   e. Decentralizing nursing education via extended degree programs;
   f. Academic status of continuing education courses for nurses, including training programs for specialist nurses such as CCU nurses and nurse practitioners;
   g. Formalized initiative to bring practice of nursing and nursing education together in order to develop the kinds of curricula needed to train nurses for new and emerging nursing roles.
4. Encourage Project in:
   a. Innovative ways to encourage trained nurses to reenter the nursing market (such as part-time work arrangements, experimental

salary and working condition incentives, etc.).

b. Nursing career education stressing realistic job opportunities and conditions, aimed at age groups identified as having the highest probability to continue practice.

c. Innovative clinical training coordination and utilization projects;

d. Experimental pilot project utilizing nursing personnel in new roles with a strong evaluation components;

e. Nursing school applicant matching system.

5. Recommended Enrollment:

a. Maintain Associate Degree and Diploma nursing programs entering class enrollment at 5,000. (The 1975 Associate degree program admissions were 4,350 and the Diploma program admissions were 355.)

b. Increase the enrollment of the entering class of Baccalaureate Degree students by 3.44% per year in line with national projected growth rate to 2,007 by 1980. (In 1975, there were 1,695 Baccalaureate Degree admissions).

c. Increase graduate enrollments in state universities by 20% to 800 students in order to increase the number of nurses with advanced training who are capable of assuming educational and administrative roles. (Approximately 400 professional nurses are receiving their graduate training in the two University of California nursing schools and 268 in the California State University nursing schools in 1975. No statistics available for private schools).

5. RECOMMENDATIONS

DENTISTRY

It is recommended that:

1. The state of California maintain on a continuing basis a health manpower intelligence system that is responsible for collecting, collating and analyzing data and information required to monitor dentist and dental auxiliary manpower and dental education trends systematically. It is recommended that this be a joint effort between the California Postsecondary Education Commission, the Senate and Assembly Research Offices, the Health Manpower Unit of the State Department of Health, the regional health system agencies in the State and the Department of Consumer Affairs.
2. There should be incentive programs to encourage the dental profession to utilize dental auxiliaries to implement preventive dental care programs in the schools and determine if they are a cost-effective means of dealing with dental disease.
3. Support should be given to demonstration projects to try out and evaluate the degree of increased productivity by utilizing expanded duty auxiliaries in private office settings.
4. Encouragement should be given to the development of educational outreach programs for dentists throughout the State. Emphasis should be given to emergency primary medical care diagnosis training for dentists in underserved areas as provided by the University of Pacific Dental Project in Elk.
5. The entering class enrollment for dental students in University of California schools should be limited to an increase of no more than 20 projected for U.C.S.F.'s program. In 1975, the total enrollment of the

entering class for the 2 University of California dental schools was 194. Based upon the rate of increase of the projected California population at 6.85% for the 1975-80 period, the recommended entering class for the 2 schools would only be 208 for 1980. The additional small expansion may be justified for an increase of educational opportunities.

It is projected, however, that the total number of licensed dentists will increase from 12,529 to 14,433 from 1975 to 1980. The ratio of dentists per 100,000 population will therefore increase from 59 to 63 per 100,000.

6. RECOMMENDATIONS

PHARMACY

The following recommendations regarding pharmacy education are presented for consideration by the California Postsecondary Education Commission.

1. The State should encourage and provide financial incentives for the development of experimental health manpower projects designed to explore extended role pharmacy and most economical use of pharmacy manpower, including pharmacy technicians. These projects should be developed in accordance with the recommendations of the Advisory Commission on Pharmacy to the California State Assemby Pursuant to HR-21 and the Second Annual Report to the Legislature on the California Experimental Health Manpower Pilot Project (AB1503).

   These experimental investigations should be conducted in a variety of settings, including community pharmacies, outpatient clinic centers, mental health facilities, acute care, intermediate and skilled nursing care facilities. The most appropriate role needs to be identified for the clinical pharmacist with respect to his potential function as a member of various health terms, interacting with the patient (including education) and other health personnel. Consideration needs to be given to not only the needed training of new pharmacists which requires the comletion of 30 hours of instruction biannually.

   Studies relating to technican training should be directed toward appropriate delegation of pharmacist tasks with consideration of the following questions:

   - What are the medical legal implications of such delegation?

- In what settings should these personnel be utilized and with what levels of pharmacist supervision?
- Who should develop the training programs, accredit them and certify students?
- What additional quality controls should be built into the pharmacy delivery system which utilizes these technicians?
- What are the cost benefits (if any) to the pharmacy and overall health delivery systems?

2. The State should monitor the patterns of establishment of residential practice of Doctor of Pharmacy students who graduate from the three California schools during the next several years. Should a significant proportion of these students establish their practice out of state then California pharmacy school enrollments should be increased accordingly.

3. The State should conduct ongoing analyses of the projected impact of increased prescriptive drug consumption under NHI (6-26% increase) upon pharmacy manpower needs. These analyses should be coordinated with the experimental health manpower studies of extended role pharmacists and pharmacy technicians. In this manner, California can rationally plan for future pharmacy manpower needs with consideration of the most economical and qualitative approach to the problem.

4. No additional enrollments are recommended for the state-supported UCSF program beyond those already projected. UCSF intends to increase the entering professional class of 109 in 1975-76 to 120 in 1977-78. The graduate enrollment will increase gradually from 50 in 1973-74 to 65 by the end of the decade.

This enrollment recommendation is predicated upon California's continuing to maintain its favorable immigration of pharmacists and retention of our graduates from UCSF, UOP and USC (particularly the Doctor of Pharmacy students. See recommendation #3. Should this pattern change significantly the enrollments at UCSF should be increased proportionately.

This recommendation is also based on the favorable distribution of pharmacists in California and the relatively yound age of the practicing professional.

It is true that California awards only about 6% of the total pharmacy degrees in the continental United State, even though the State encompasses 10% of the country's population. Additionally, California ranks 39th with respect to pharmacy student/population ratio.(20) However, currently only 80.8% of the pharmacy students nationally are enrolled in schools in their home state, whereas California educates 94% of its studenets within the State. The issue appears to be how the State can best utilize new resources which might be used for pharmacy education.

It appears at the present time that the State could best utilize new resources for pharmacy education to support experimental training and retraining projects for pharmacists and technicians in rational preparation for changes in the delivery system which will parallel the institution of NHI. California, with its strong Doctor of Pharmacy programs and AB 1503 enabling statutes should most appropriately provide this leadership in experimentation with the delivery and educational systems.

7. RECOMMENDATIONS

OPTOMETRY

The following recommendations regarding optometry education are presented for consideration by the California Postsecondary Education Commission.

1. The State should encourage the development of experimental training programs to test the feasibility of utilizing optometric technicians in a variety of health care settings. Such studies should be oriented to task analysis, provider acceptance, consumer acceptance, cost efficiency and effect upon the quality of vision care services. These programs may be appropriately initiated under the auspices of the experimental health manpower training provisions of AB 1503.
2. The State should monitor the impact of the trend on the part of the SCCO to enroll out-of-state students upon the California optometric manpower situation. Annual analyses should be made of the change (if any) in the proportion of SCCO graduates who establish their optometric practice outside of California. If this factor significantly affects the optometrist license supply in California the state should consider the establishment of a contract program with the SCCO.
3. An alternative recommendation to the establishment of a contract program with SCCO (#2 recommendation) is expansion of the UCB program to make up the difference in the declining enrollment of California students at SCCO. Such an expansion should include clinical outreach programs to the northern and southern portions of the State. The State should conduct a cost effective comparison of a contract program with SCCO versus a program expansion at UCB.

4. No additional enrollments are recommended for the UCB program beyond those already projected. UCB and SCCO enrolled 64 and 96 first year students respectively in the current year (a total of 16). If Hopping's projection that California schools will will have to admit a combined total of approximately 158 students per year in order to maintain the present optometrist/population ratio. The State is currently meeting that objective. This recommendation is predicated upon the State's monitoring of the change in the mix of California to out-of-state students at the SCCO and the subsequent impact upon licensure patterns (recommendation #2). It should also be noted that the enrollment recommendation is based upon the lack of sufficiently compelling rationale to increase the ratio of optometrists to population in California which is presently 1/8,416 (the seventh highest rank in the country). HEW identified the minimum ratio as 1/15,000 and England-Wales with a national health service has a ratio of 1/10,057. Given the latter figure, the AOA recommended ideal of 1/7,000 seems to be somewhat liberal. Furthermore, after intensive study of the ratio issue, the State Council of Higher Education of Virginia arrived at the conclusion that a ratio of 1/14,000 was sufficient to meet their state needs. Kaiser Permanente of Los Angeles maintains a ratio of 1/18,750. A comparative study of six large prepaid group health plans showed a range of 1/12,000 to 1/18,800 in the optometry/patient ratio.

It must be remembered that the fee-for-service pattern of optometric care is a self-restricting system of demand. With a more accessible system of care, such as may be provided under national health insurance the demand for services may increase in quantum fashion. Or stated in another way, the present demand for optometric services may bear little relationships to the need for services; an issue which was not within the purview of this analysis.

The State should, on an interim basis, be prepared to support an additional enrollment of about 10% for optometry education in the event of passage of national health insurance legislation which includes an optometry services provision.. This recommendation is bassed upon the effect of Medicaid upon the demand for optometric services. The 10% enrollemnt figure should only be used as an academic planning guideline and should be revised in relation with the specific provisions of any national health insurance legislation and the availability of more definitve analyses of manpower requirements.

III. NATIONAL LEGISLATION AND MALPRACTICE ISSUES

1. THE IMPACT OF FEDERAL HEALTH MANPOWER LEGISLATION

In attempting to determine the impact of pending federal health manpower legislation on the state of California, it must be kept in mind that the law which is finally enacted will not become effective until 1977, at the earliest. The length of time required to implement its mandates will vary according to the specific provisions, thus possibly delaying their full impact until the 1980s. The impact of those provisions which focus on medical students newly enrolled after enactment of the legislation will be even further delayed by the length of the physician training process.

Decisions on capitation payments are likely to have the most immediate effect on the medical schools. It seems clear that capitation funds will continue to be available to medical schools, but the amount per student could be reduced and the requirements for receiving the payments will address very different issues than in the past. In order to receive capitation payments under the new federal legislation, medical schools will be required to shift their focus from increasing enrollments to actions which seek to alleviate problems of geographic and specialty maldistribution.

A reduction in the amount of capitation payments will have a more profound impact on private medical schools in California which cannot rely on state funding. Both state and private institutions may feel compelled to compensate for a reduction in capitation payments by increasing tuition. Being part of the state supported educational system, the public medical schools in California will be able to absorb a greater reduction in capitation payments than their private counterparts in the state before having to resort to tuition increases.

The various bills currently before the Congress differ in the extent to which they use capitation payments to achieve federal objectives. There are some proposed stipulations--such as the requirement that each student agree to provide service in an underserved area in order for the school to receive capitation funds--which the medical schools in California may find unpalatable. If such requirements were enacted into law, the medical schools in California might refuse to comply and thus sacrifice all capitation funding. In this instance, it is reasonable to assume that all schools, public and private, would be forced to increase tuition. It is likely that those provisions perceived to be the most severe or an encroachment on a school's academic freedom will not appear in the legislation which emerges from Congress; but it is still too early to predict the outcome.

The emphasis on enrollment increases which existed in federal health manpower legislation since 1968 and was encouraged through capitation payments in the 1971 legislation, has been greatly diminished in the currently pending bills. The Congress has come to recognize that increasing the supply of health professionals does not guarantee improvement in their distribution, either geographically or by specialty. Many have reached the conclusion that the nation now has an adequate or even excessive supply of physicians and that all efforts should be concentrated on redistribution to improve the availability of their services.

With respect to enrollment increases, alternative requirements in the current bills range from maintenance of enrollment to only modest increases. In the short term, neither provision will have a significant impact on California. A problem could arise in the future, however, as a result of California's reliance on physician migration from other states for a substantial portion of its physicians. If states which have been losing their medical school graduates to other states, such as to California, develop new networks of educational programs focused on retaining their graduates, the number of physicians migrating to California in the future may diminish. Indiana established such a program in 1967 which has achieved very successful results for the state. When the program was initiated, 428 interns and residents were training in hospitals in two Indiana cities. During the academic year 1973-74, 697 interns and residents were located in seven cities throughout the state and over 90% of the available positions were filled by graduates of U.S. medical schools. One result of this growth and regionalization of graduate training has been a 10% increase in the number of physicians practicing in Indiana in the past four years while the population increased by only 3% during the same period.(1)

Beyond the efforts of states which currently export physicians to retain their graduates, the location of new medical schools may also have a negative impact on the migration of physicians to California. Held has shown that the "net migration" of physicians to the Pacific region as a percent of local production is lower for the South Atlantic, East South Central and West South Central divisions of the country than for any division but the Mountain states.(2) According to the latest education report by the American Medical Association, the majority of medical schools currently in various stages of planning are located in the southern divisions. (3) If the trends identified by Held continue, the graduates of these new schools are likely to migrate to areas of the country othern than California.

Changes in the migration flows of physicians to California as a result of these factors are not likely to be felt for at least a decade. Other factors such as economic conditions within the state could also alter migration flows, but consideration of this aspect of the issue is beyond the scope of this paper. It should be noted that studies currently being conducted by Held (4) suggest that physicians in many areas currently have excess capacity to provide services which could be expanded to partially compensate for a decreased flow of physicians into California from other states.

Since there is now considerable agreement on the need to regulate the numbers and quality of foreign medical graduates (FMGs), it can be assumed that the final legislation will include provisions addressing this issue. Whatever actions are taken--changing immigration laws, rescinding the Department of Labor declaration of a physician shortage, requiring all candidates for graduate medical education to pass the same qualifying examination--the result will be a reduction in the number of foreign medical graduates entering training and practice in the United States. California will be far less affected by this reduction in FMGs than many other states since it ranks among the states with the lowest number of FMGs in residency positions and in practice. In 1970, 7% of California residents were foreign medical graduates and 10% of total physicians in the state were FMGs.(5) Those hospitals in the state which currently rely heavily on FMGs to meet their staffing needs could suffer adversely by the reduced flow of FMGs, the most immediate impact being felt at the residency level with the impact on the number of practicing physicians being felt over a longer term. If the number of residency positions are reduced to more closely correspond with the number of U.S. graduates, as has been proposed in several bills, these institutions would be in a better position to recruit U.S. trained physicians. An additional avenue for exploration is the substitution of nurse practitioners and physicians' assistants for FMG residents and physicians to compensate for their diminished availability.

Among the various provisions proposed for improving the distribution of physicians by specialty, implementation will proceed more quickly for some than for others. Once fully effective, the impact of those affecting the distribution of residency positions among specialties will be felt for several decades as the change in specialty distribution at the residency level is translated into practice by the individuals who emerge from the effected positions.

Those provisions requiring changes in medical education--such as the establishment of a separate administrative unit for family practice or preceptorships in primary care--will pose little or no problem for those schools in California which already conduct such programs and could be initiated relatively quickly by those which do not have such programs currently underway. The changes which will have the most profound impact on specialty distribution, and the actions stimulating the greatest controversy, impact on graduate training.

It is reasonable to assume that no matter which bill is enacted, it will incorporate a requirement that at least 50% of a school's affiliated residency positions be in the primary care specialties of internal medicine, general and family practice, pediatrics and perhaps obstetrics and gynecology. The provision is likely to allow three years in which to phase in the full number of primary care positions. The proportion of all residency positions in the United States represented by internal medicine, general and family practice and pediatrics in 1973 was 38%. Including obstetrics and gynecology raised the figure to 43%. The state of California had only a slightly higher proportion of its residents in the primary care specialties, thus requiring roughly a 6% to 10% increase in the number of first year primary care residency positions by 1980 to meet the legislative mandate.

A major impact of this provision on all schools will be the need to expand their ambulatory training capacity to accommodate the increased numbers of primary care residents. Such expansion can take a variety of forms in addition to increasing currently existing capacity within teaching institutions. In California, this might encourage decentralization to those areas where facilities exist which have the capacity to participate in graduate training programs.

For those teaching hospitals which are located in inner city neighborhoods, the possibility of expanding ambulatory training capacity through neighborhood clinics could improve the availability of services to inner city populations while at the same time meeting the ambulatory training needs of the teaching programs. Moreover, such a program of training and service would respond to legislative mandates for improving access to care for underserved populations.

An obstacle which schools will face as they seek to expand their ambulatory training capacity arises from current third party reimbursement schemes which have traditionally discriminated against ambulatory care. Residents in specialties other than primary care can help pay their way through graduate training by providing reimbursable services to hospital inpatients. Without changes in current reimbursement policies, this source of support will be greatly reduced for primary care training. The result in California may be that state supported schools will attempt to make up for this deficit by seeking state subsidies for ambulatory care training programs.

The almost universal support by representatives of the profession for the recommendation that 50% of all residency positions be in primary care specialties will not minimize the interdepartmental competition for positions which will occur in the various medical schools and teaching hospitals as a higher proportion of positions are allocated to primary care. This competition will become especially intense if the proposed limitation on the total number of first year residency positions is enacted into law. Although this provision was deleted from the House bill, it remains a major option in the Senate, and could therefore be reconsidered in Conference.

Limitations of the total number of residency positions to a specified percentage of the number of U.S. medical school graduates (probably 125%) is often misconstrued as an action which will reduce the current number of available residency positions. This is in fact not the case. Since the number of students enrolled in medical school has increased substantially in the past five years the number of residency positions needed to equal 125% of U.S. medical graduates in 1980 will be slightly higher than the number of currently available positions. Since such a provision would be phased in over a three year period, there would be no loss in current residency positions in California as a result of its implementation. The opportunity to increase residency positions would be constrained in the future, but a control of absolute numbers is necessary in order to achieve the proper distribution among specialties. If the total number of residency positions is not controlled, the absolute number of positions in over-supplied specialties can continue to expand even with a requirement that 50% of all positions be in primary care. This translates into increased costs for training the wrong types of specialists as well as the increased costs which are then associated with their practice in an oversupplied market.

An additional benefit of controlling the total number of residency positions will be derived from institutions which currently rely heavily on FMGs to meet their house staff needs. With more individuals graduating from U.S. medical schools and fewer residency positions in excess of their numbers, U.S. medical graduates will begin to fill some of those positions which traditionally attracted only FMGs. FMGs will still be entering residency training in some institutions but their numbers should be fewer and the quality of their services equal to that of U.S medical graduates due to the provisions incorporated in a new health manpower bill.

Finally we turn to the question of improving the availabilty of physicians to currently underserved populations. On the medical school level, the Congress may decide to require or encourage remote site training experiences for third and fourth year medical students. Most schools in California are already engaged in such training, to greater or lesser extents, so a provision to establish these programs would not seriously alter current practices.

The major thrust of any new health manpower law will be a major expansion of the National Health Service Corps (NHSC), encompassing from 25% to 50% of newly enrolled medical students after enactment of the legislation. Students will receive scholarship support during their training and will then pay back the federal government through service after completion of their residency. Physicians who did not participate in the scholarship program may also volunteer to practice in the National Health Service Corps.

For several reasons, it may take at least a decade before the impact of an expanded National Health Service Corps is felt in the nation generally and, more specifically, in California. The NHSC was created by Congress in 1971. As of June 1975, there were 551 NHSC personnel, including 325 physicians, 80 dentists and 146 physician extenders at 268 sites. It is anticipated that 85 additional health professionals will be placed in the fiscal year ending June 1976. A NHSC scholarship program which covered 25% of all newly enrolled students would require the annual placement of roughly 3,750 physicians beginning in 1984 assuming an average of seven years for completion of medical training. The length of time alone to prepare a physician for practice delays the impact of the NHSC program for quite a few years.

In the meantime, the National Health Service Corps can also recruit physicians who began their training before enactment of the legislation in order to meet some of the immediate needs of underserved areas. It is questionable at this time, however, how quickly the NHSC can expand in order to accommodate such volunteers. Of equal concern is the length of time required for the agency to become sufficiently well organized to administer a program of the magnitude contemplated in the proposed legislation. It is anticipated that the seven years required for entering medical students in 1977 to complete their residency training will provide the necessary lead time for the NHSC to prepare for placement of several thousand physicians annually. An additional unresolved issue is whether the duration of service in the NHSC should be two or four years. While not reducing the annual number of physicians needing placement, a shorter term of service would lessen the burden on the administrative process by reducing the number of health professionals in the programs.

Expansion of the National Health Service Corps will not have a significant impact on the state of California during the next decade, and it is too early to predict its impact beyond that time.

The ultimate impact of the various federal health manpower policies currently being proposed in Congress may not be felt for a decade on the state level. The federal government can mandate and provide financial support--two vital components in policy development and implementation--but the style of the programs will depend heavily on how policies are interpreted and implemented at the state level. It is therefore necessary for the state of California to be aware of federal policies which will affect the supply, distribution and practice patterns of its health professionals and to be active in translating federal policy into action within the state context.

The Congress was unable to reach agreement in 1974 on the extension of the Comprehensive Health Manpower Act of 1971. Each of the major health manpower bills--the Rogers Bill (H.R. 5546), the Kennedy Bill (S. 989) and the Beall Bill (S. 1357)--was reintroduced this year along with the Administration's previous bill and several others. The House Subcommittee on Public Health and the Environment, chaired by Congressman Rogers, held two days of additonal hearings in

February. The Rogers Bill was again approved by the Full Committee on Interstate and Foreign Commerce and sent to the floor of the House in July. This year, proponents of the Bill were unable to counteract the opposition encouraged by the AMA to the provisions for controlling the number and distribution of residency positions. Although the majority of the provisions remained intact, those addressing postgraduates residency training were removed by the House-approved Bill. Deletion of the provisions seriously weakened the Bill in the two critical areas they were intended to address:

> improvement in the distribution of physicians among specialties by controlling the total number of residency positions and encouraging that at least 50% of available positions be in primary care.
>
> control of the influx of foreign medical graduates by reducing the number of available residency positions which are in excess of the number of graduates of U.S. medical schools. The bill included no other provisions for controlling the flow of FMGs.

The Senate Subcommittee on Health, chaired by Senator Kennedy, refrained from taking any action on health manpower legislation until the House completed its deliberations. Beginning in September, the Subcommittee convened a series of additional hearings which continued intermittently through mid-November. During the course of those hearings, an event took place which retrospectively may mark the turning point in the stalemate on key provisions of the various health manpower proposals. Invited to testify again before the Subcommittee, the Department of Health, Education and Welfare--inspired by the efforts of the Assistant Secretary for Health, Dr. Theodore Cooper--attempted to again gain approval from the Office of Management and Budget for an Administration bill which would be responsive to the critical health manpower issues identified by Congress. Receiving no response from OMB by the eve of the Subcommittee hearing, the Department sought Presidential intervention which resulted in their being able to present a new proposal to the Subcommittee including the following major provisions:

continuation of capitation support for those schools willing to participate in meeting national health manpower objectives by:

1. setting aside first year places (15% of the first year class in 1977 increasing to 25% in 1979) for students who volunteer to practice in underserved areas.
2. establishing an administrative training unit in family practice or primary care.
3. having an increasing proportion of residencies in their affiliated institutions in primary care (at least 35% in 1977 increasing to 50% in 1979).

consolidation of existing scholarship programs into a broad scholarship program conditioned upon a service commitment.

special project grants for:

1. establishing or expanding family practice or primary care training and residency programs.
2. Community Based Health Manpower Education Programs and Area Health Education Centers for decentralized training and continuing education.
3. training of physician extenders.
4. assisting U.S. citizens studying abroad to transfer to U.S. medical schools and upgrading the skills of FMGs in the United States.

discussion between DHEW and the Departments of Labor and State regarding administrative changes in FMG immigration policy and development, in conjunction with professional groups, of a single exam to be taken by all FMGs and U.S. graduates as a prerequisite to entry into graduate medical education.

preadmission and scholarship programs for disadvantaged students in post-baccalaureate programs and in the first year of medical school.

The Administration's proposal has been submitted as a bill to the Congress. Its emergence, however, seems, to have provided the needed impetus for the Senate Subcommittee to devise a new strategy which might appeal to a broader base within the full Committee on Labor and Public Welfare and on the Senate Floor. The Subcommittee staff has indicated that it is considering various provisions which seem to "make sense" in light of the proposals which are currently pending before the Congress. Whether a new proposal will come forth from these deliberations remains to be seen.

In his report last August, John Iglehart remarked that "working out a viable solution (to attract health professionals to rural and inner city areas that lack adequate medical manpower) is the toughest task ahead for legislators involved in extending the Comprehensive Health Manpower Act of 1971." Although several "solutions" to this problem have been proposed, which, if any, should be enacted into law remains central to the forthcoming debates on the Senate floor and in the House-Senate conference. Although Senator Kennedy may be amenable to softening his demand for all medical students to agree to provide service in designated underserved areas, he would be unwilling to sacrifice his convictions for the informal mechanism approved by the House which encourages students to serve through a major expansion in the National Health Service Corps. Senator Beall and the Administration have assumed what appear to be compromise positions in proposing that a specified proportion of positions in the first year class be reserved for students who would volunteer to participate in the National Health Service Corps service-connected scholarship program. This approach, as well as mandatory service, has been opposed by Congressman Rogers. In a recent speech at the Association of American Medical Colleges Annual Meeting, Congressman Rogers questioned the need to require certain percentages of medical students to provide service in exchange for scholarship support. "I am troubled that a percentage requirement could result in a track system--wherby the very best students are admitted early, without demands to accept scholarships, with the remainder of the class becoming branded as that percentage of students not quite good enough to get into medical school without paying a social premium." Whether for this or other reasons, it is interesting to note the number of witnesses testifying before the Senate Subcommittee this year who have reached the conclusion, although often reluctantly, that any program of service must apply with equal risk (such as a lottery) to all students in order to prevent discrimination.

Although the provisions on capitation payments and foreign medical graduates incorporated in the various proposals differ from one another, the disparities are not substantial enough to prevent consensus on a single solution. Even if not embodied in each of the pending proposals, there now appears to be general agreement on the need to continue capitation support and on the types of actions which should be taken to regulate the numbers and qualifications of FMGs in training and in practice in the United States.

One additional area which is bound to generate considerable debate is the regulation of residency training. The proposals currently before the Senate range from placing a ceiling on the number of available residency positions and redistributing those positions to create a more appropriate balance among primary care and other specialties to requiring schools to have a specified percentage of the residencies in their affiliated institutions in a family practice or primary care. As previously noted, the provision in the Rogers Bill to control the number of available residency positions was deleted from the House-passed bill. The debate on this issue will include not only what, if any, regulation of residency training the federal government should mandate, but whether implementation of that mandate should be the responsibility of a private professional body or a public body.

The health manpower training bills are currently being considered by the Senate Health Subcommittee of the Committee on Labor and Public Welfare. There is a reasonable chance that the bill sent to the floor of the Senate by the full Committee this year will have braoder support from the Committee members than did the bill last year. This support could extend to the Senate floor thus avoiding a fate similar to last year's Committee bill. Much of what occurs after the Senate action rests on the composition of the House-Senate conference participants. Whether or not the conference will be able to report out a bill depends upon how adamantly committed or opposed to the key controversial provisions each conference member is and how willing each is to negotiate a policy which compromises that position.

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2. THE EFFECT OF PROFESSIONAL LIABILITY PREMIUM RATE INCREASES ON PATTERNS OF PHYSICIAN PRACTICE IN CALIFORNIA
PRELIMINARY REPORT (MARCH 1976)

Background

Between 1960 and 1974 malpractice premiums per doctor in California increased 550%, from $400 to $2,600--an annual increase of 14%.(1) During the past year rates went up dramatically. On May 1, 1975, a 320% premium increase by Argonaut Insurance Company sparked a physician slowdown in the San Francisco Bay Area. On November 1, 1975, Travelers Insurance jumped its rates for the rest of Northern California by about 350%. On January 1, 1976, Travelers' rates in the Los Angeles Area increased by about 500%, spawning another physician slowdown, and Continental National's in the San Diego Area were up 190%.*

The increase in premiums affects different physicians in different ways. A general practitioner in the Travelers' NorCal program doing little or no surgery or obstetrics would have been a Class I physician paying $1,032 prior to November 1 for 1 million/3 million coverage. After November 1, his rate was $4,641. On the other hand, an obstetrician in Class IV, paying $13,581 before November 1, would subsequently have been paying $22,139. In the LA Area a general practitioner in Class II in the Traveler's program would have been paying $1,296 before January 1, 1976, and $7,783 after January 1. An LA obstetrician would have been in Class VIII paying $6,304 before January 1 and $36,239 after.

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* In California physicians have been covered by group plans in particular geographic areas. The Argonaut plan covers San Francisco, Alameda, Contra Costa, Marin, Siskiyou, Shasta, Solano and Trinity Counties. Travelers NorCal covers the 23 other Northern California counties. Travelers SoCap covers the LA Area and CNA, San Diego, Riverside and Imperial. Since rate increases were announced, physicians have formed their own insurance companies, for the most part paralleling the areas covered by the other insurance companies.

The most significant rate increases affected specialists performing surgery, anesthesiology, obstetrics and orthopedics, and least on general practitioners, pediatricians and internists, and others for the most part not performing significant amounts of surgery.

The end of rate increases may not yet be in sight. Consulting actuaries to the Joint Legislative Audit Committee estimated future premium increases at about 25% per year, noting, however, that recent legislation could reduce malpractice costs if "supported by the courts and recognized by juries."(2)

There are a number of ways that physicians might react to premium rate increases. They could choose to:

1. change location;
2. retire early or eliminate part-time practice;
3. change their practice setting (e.g., from solo practice to public employment or salaried group);
4. leave medicine;
5. change the services they provide to either lower premium rates, reduce exposure to suits or otherwise reduce costs, e.g., eliminate certain certain procedures or types of patients such as Medi-Cal;
6. raise fees to absorb all or part of the increased cost; reduce limits of their coverage and thereby premiums, or practice without insurance;
7. protest increases by withdrawl of services.

These choices have influenced the availability, quality and cost of medical care in California and may have subtantially greater impact in the future, particularly if rates continue to climb.

We have in this study attempted to compile data from various sources to shed light on actions taken by physicians since premium increases occurred.

We caution that what we have identified are emerging patterns and that many likely future effects may not yet have appeared in available data sources.

Following is a summary of findings, a brief discussion of implications for quality of care, a presentation of our tentative conclusions and suggestions for further research.

Summary of Findings

Movement to Other States

It is difficult to determine exactly why a physician may have chosen to move but we find no evidence that California physicians in significant numbers are leaving California to practice elsewhere as a primary result of premium rate increases. Surveys of CMA member physicians, confirmed by reports from Medical Societies, show that few (less than 1% of respondents) have chosen to leave the State primarily for this reason. A larger number are considering leaving and perhaps may if premium rates continue to increase here more dramatically than other states. In a number of instances those who have left appear to be counterbalanced by new physicians.

According to the Board of Medical Quality Assurance staff there have been no noticeable increases in requests by California physicians for endorsements to practice in other states since premiums increased. Even though statewide effects of physician movement to other states may at this time be minimal, there may be important effects in particular rural communities. For example, the Lassen-Plumas-Modoc-Sierra County Medical Society, with 28 members, reports that 3 moved to another state due to rising premiums. The 23-member Siskiyou Medical Society reports that 2 members moved. The 138-member Humboldt-Del Norte Medical Society and the 161-member Butte-Glenn Medical Society report 4 have left each area and the 120-member Shasta-Trinity Medical Society reports 2 have moved.

Premature Retirement

As with movement from the state, it is difficult to determine specifically why a physician may have retired at a particular time. Evidence from the CMA survey and our survey of Medical Societies indicates that a number of doctors, many who were practicing part-time, have retired early, apparently because the

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comparatively low gross income generated by part-time practice was not enough to cover increased premium costs. Although it does not appear to be a major problem statewide (less than 2% of CMA Survey respondents indicated they retired early), it may have a more serious impact in sparsely populated areas. For example, the 17-member Inyo-Mono Medical Society reports that 2 physicians retired by eliminating their part-time practices. Six are said to have retired from the Butte-Glenn Area (161 members), four in the Humboldt-Del Norte Area (138 members), several from Tulare (170 members), 3 in San Luis Obispo (139 members), 2 from Shasta-Trinity (118 members), several in Placer-Nevada (130 members), 4 in San Joaquin (360 members), 1 in Napa (140 members) and 1 in Sonoma (286 members).

Recent actions by Northern California insurance companies may help reduce early retirements of those with part-time practice. NorCal Mutual and the Medical Insurance Exchange now provide for reduced premiums for part-time physicians.

Moved to a "Closed Setting"

There is evidence that small numbers of physicians have left solo practice for closed settings such as military service, salaried group practice, hospitals and other government positions where a third party is responsible for malpractice costs. In the CMA survey, those indicating they had moved to a closed setting were small (about 2% of respondents). Military service has been made much more attractive by recent substantial pay increases for both new physicians and those with prior military service. Thus the pull of military service salaries may have been as important for those choosing this setting as the push of liability increases. Reports from the following smaller medical societies indicate some movement to closed settings, primarily the military and state facilities:

San Joaquin	2 left for closed setting (1 emergency room, 1 city hospital)
Napa	3 to state hospitals
Placer Nevada	3 (2 to Air Force)
San Luis Obispo	3 to state
Lassen-Plumas-Modoc-Sierra	1 to state
Humboldt	2 to closed setting
Tulare	1 to military
Sonoma	4 to military
Butte-Glenn	2 to closed setting

Discussions with county officials indicate they are finding it easier to fill vacant physician positions. Preliminary information from group practice plans indicates that, although there have been increases in applications, a number of positions which were previously difficult to fill are still unfilled.

Changes in Services to Lower Premium Rates

One important way that a physician can reduce his premium is to change the scope of services he provides and thus lower his premium class. This can be done by eliminating or reducing certain procedures. For example, a family physician, internist or opthalmologist covered by Travelers Insurance in Northern California, who derives between 1% and 5% of his gross income from surgery or obstetrics or both, would be a Class II physician paying an annual premium of $8,810 for $1/3 million coverage. If he earned more than 5% of his gross from surgery or between 5% and 15% from OB, his annual premium would be $14,766. If he reduced his surgery or obstetrics to 1% or less of his gross income, he would pay $4,641, saving $4,169 if he was previously in Class II and $10,642 if he was in Class III. If the income derived from surgery and obstetrics was insufficient to justify the premium cost, then the physician might reduce or eliminate them to reduce his premium. Similarly, a family physician practicing anesthesiology in Siskiyou County and covered by Argonaut would be paying more than four times the premium of a Class I physician not administering anesthesia or performing surgery. If he administered anesthesia infrequently, he would be encouraged to eliminate doing so.(3)

Similar tradeoffs exist for other specialists. For example, internists utilizing radiation or performing angiograms would be in a higher class than those who do not. Ear, nose and throat specialists who perform plastic surgery or psychiatrists employing electroshock treatment pay higher premiums than those who do not.

The pressure to make some class change would fall most heavily either on older physicians likely to have smaller practice or those earning less gross income from these procedures than the cost of increased premiums to cover them. Thus the premium structure trends to encourage the following actions:

1. Reduction or elimination of surgery, obstetrics, orthopedics and anesthesiology by those who do not specialize in it or are not primarily dependent on it as an essential part of their practice.
2. Transfer of patients to those who specialize in these procedures.
3. Reduction or elimination of assistance at surgery by physicians on patients not their own.

Our preliminary analysis indicated that a significant number of physicians are reducing the scope of services they provide to reduce their malpractice premiums. Survey data we have analyzed, made available by the Auditor General's Office, shows that:

- 21% of respondents to this August 1975 survey (53 of 252 useable responses) said they had reclassified their practice for insurance purposes and an additional 19 without being asked said they intended to do so in the future.(4)

- If responses are adjusted for those who expressed intent to reclassify in the future, then 29% of all respondents indicated they had or would reclassify their practice.
- Almost half of those indicating practice change were family physicians and these constituted about half of the "Yes" responses. Most family physicians said they were reducing surgery and obstetrics. Other practitioners who gave reasons for reclassifying their practice also indicated they were, for the most part, reducing surgery.
- Those who reclassified were also generally older than those who did not.
- Physicians in the areas already impacted by rate increases were more inclined to reclassify their practice.
- Although the response from rural areas is small, physicians in nonmetropolitan statistical areas were more inclined to reclassify than those in metropolitan areas.
- Most of those who reclassified were doing little surgery (i.e., earning less than 5% of gross income).
- Average malpractice premiums represented about 7% of the gross income of all respondents. Those who were already hit by rate increases paid an average of 11% of gross income for premiums. Premiums as a percent of gross income were higher for those in metropolitan than nonmetropolitan areas.

Most of these findings were validated in the more recent and larger sample survey conducted by CMA. (5) In that survey a similar percentage (19%) of the respondents said they were limiting the spectrum of services they provided to lower their premium rate. About half of those who said they reclassified were family physicians and the "Yes" responses from this group were almost half of GP respondents. Also those who limited their services were older than those who did not and those in nonmetropolitan areas are more inclined to limit their spectrum of services than those in metropolitan areas.

Another important indicator of practice change by physicians is the extent to which they have changed insurance premium class to lower rates. Preliminary data supplied by March & McLennan, insurance brokers for Argonaut Insurance Company, indicates that 13% of the physicians who renewed their liability insurance subsequent to the May 1, 1975 rate increase changed their premium class (239 to 1823 renewals). Most (60%) of these were family physicians eliminating or reducing surgery and obstetrics. A significant number of general surgeons and orthopedists also changed class (20% of 239, 10% each), but many of these changed back to their former class after the slowdown.

Preliminary data from Johnson & Higgins, brokers for the NorCal Mutual program, indicates that about 14% of those who switched coverage from Travelers to the doctor-owned company after November 1, 1975, changed premium class (about 400 of 1,200). Most of these class changes also were by family physicians reducing or eliminating surgery and OB.(6)

Most county Medical Societies who responded to our survey report changes to limit the spectrum of services provided as follows:

Butte-Glenn (161)*	4 limited spectrum of services
Tulare (160)	some curtailment of surgery, anesthesiology and OB by GPs
Shasta-Trinity (130)	several no longer assist in surgery

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* Number in parentheses refers to number in Medical Society.

Humboldt-Del Norte (138)	about 15 physicians have limited their regular services to lower premium rates
Mendocino-Lake (78)	a number have changed premium class but it is hard to tell how many. Some are reducing surgery and OB
Siskiyou (23)	2 eliminated surgery -- others considering additional limitations
Lassen-Plumas-Modoc (29)	8 limited services to lower premium rates
Tehama (18)	1 limited surgery
Merced-Mariposa (95)	3 in Merced reduced surgery and obstetrics
Placer-Nevada (130)	GPs reducing surgery and obstetrics (OB-GYN man dropped OB)
Inyo-Mono (17)	4 GPs have eliminated obstetrics and "have become virtually unavailable to assist in surgery on other than their own patients"
Napa (140)	several have changed their practice to reduce premiums
San Joaquin (360)	50 have limited their services to lower premium rates
Yolo (168)	some GPs reducing surgery and OB
Stanislaus (278)	"many" physicians have changed premium class reducing surgery, obstetrics primarily
Sonoma (286)	5 reduced scope of practice to reduce premium rate
San Luis Obispo (139)	GPs have cut out surgery and OB
San Mateo (675)	reducing OB
Mendocino-Lake (90)	a number have changed class
Marin (320)	there has been restructuring of practice by GPs and family physicians to reduce premiums

Santa Clara (1,465)	30 of 72 responses to survey (7%) said they eliminated OB, 39 said they gave up major surgery. Most of these are GPs. There are 275 GPs in Santa Clara; therefore about 15% of GPs are reducing scope of services.

Thus, preliminary indications from surveys of physicians, insurance company data and surveys of Medical Societies indicate that perhaps 10% to 20% of Northern California physicians, mostly family physicians may be changing the scope of services they provide to reduce premium rates.

Patient Care

The overwhelming majority of Auditor General survey respondents (120 of 205) noted that the current malpractice situation had resulted in increased use of lab tests, xrays, consultations and hospitalizations either as a precautionary measure or to document a diagnosis, and that many of these procedures were not medically necessary.

Other important effects on patient care noted by physicians responding to the Auditor General's Survey were that the doctor-patient relationship was negatively affected due to increased mutual suspicion, reluctance by physicians to take risky cases, and their increased tendency to view patients as potential adversaries. Some respondents noted that (1) care may not be continued for those who question treatment; (2) too much time is taken to explain the risks of certain procedures and stress potential complications, and (3) those with whom rapport is not good and are viewed as potentially liable to sue may be referred elsewhere more readily. One physician, however, noted that "in some ways the recognition of professional liability had improved the quality of medicine" but had also resulted in "too much caution."

CMA survey results tend to show that some physicians are inclined to change practice by limiting the number or type of patients they treat.

Many, in both the CMA and Auditor General Survey, said they would cut down treatment of Medi-Cal patients. The tendency to limit practice appeared greater amongst ear, nose and throat men, anesthesiologists, obstetricians and specialized surgeons. Our medical society survey respondents also indicated that "high risk" patients may not be treated and referred elsewhere.

Impact on Medi-Cal

An important potential effect of increased premium rates could be to increase the disparity between fees charged to private patients and those reimbursed by the state for Medi-Cal. This could result in a decline in physician participation in the program and thus a reduction in the availability of care to Medi-Cal patients. Physicians are unable to pass the increased cost of professional liability on to the Medi-Cal program because reimbursement is based on physician charges made prior to 1971. Thus, it is reasonable to expect that increased malpractice rates will exacerbate the problem of fee-for-service physician provider reluctance to participate in the program.

The apparent reluctance of physicians to accept new Medi-Cal patients was documented before malpractice increases in a CMA survey taken during the end of 1974 where 12% of respondents said they definitely would not accept a new Medi-Cal patient and about 25% said they "probably" would not accept one.(7)

A telephone survey of 200 general practitioners and internists conducted by the Health Department during late March and early April of 1975 (before rate increases went into effect) revealed that it was considerably easier for a new private patient than a new Medi-Cal patient to get an appointment. About 80% of the physicians were willing to see a private patient and about 40% were willing to see a Medi-Cal patient. Despite this apparent reluctance to take new patients, preliminary data on provider participation in the Medi-Cal program shows no recent statewide major downturn in the number of Medi-Cal physician providers. Preliminary analysis of data supplied by Medi-Cal fiscal intermediaries, the State Health Department and the Hospital Council of Northern California indicates the following:

- Between the years 1973, 1974 and 1975 the number of participating physicians, claims and payments have increased in each year. It should be pointed out, however, that this data does not include payment for most services provided during the last quarter of 1975.
- In the metropolitan areas affected by the May 1 physicians' slowdown (i.e., San Francisco, Alameda, Contra Costa):
  1. physician visits and payment drop about 10% when compared to the previous quarter, but then increase substantially during the quarter following the slowdown;
  2. recipients of physician services after the slowdown jump to prior levels;
  3. the number of first visits (which are a partial proxy for new patients) dropped about 14% between May and the preceding quarter but increased during the post-May quarter to a level substantially higher than the pre-slowdown period tending to indicate a willingness on the part of physicians to treat new Medi-Cal patients;
  4. the percent of new to total visits goes down very slightly during the slowdown period but during the post-slowdown period is even higher than before the slowdown.
- Even though community hospital occupancy dropped in San Francisco and the East Bay during the physician slowdown, the percent Medi-Cal of their average daily patient census did not decline indicating that Medi-Cal patients were not treated differently than private

patients during the slowdown period.

This initial evidence indicates on a statewide basis that Medi-Cal patients are getting access to physicians and in the Bay Area recipients and visits show no continuing downturn after the slowdown. Since this data base does not include significant data from the period during and after November 1975 (rate increases affecting 23 non-Bay Area Northern California counties and all of Southern California), it does not provide a basis for assessing the statewide impact of malpractice increases. In addition, changes may have occured in some of the more rural areas impacted by the May 1 increase which are too small to significantly affect statewide data.

More recent data from surveys of physicians and medical societies since malpractice premiums increased tend to suggest:

1. in urban areas there may be some shifting of patients from those who may no longer be seeing new Medi-Cal patients to those who are still willing to accept them;
2. in rural areas there may be problems of access to care, especially obstetric care.

In more rural areas access to obstetric care is made less available to the extent family physicians reduce their OB care to lower premiums and increase their reluctance to see Medi-Cal patients because of low reimbursement rates which equal about one-third the private patient fee. This theoretically would increase the workload of obstetricians in these areas generally and, because they are even more busy with private patients, make them less inclined to accept Medi-Cal.

Medical societies indicate increased reluctance of physicians to accept Medi-Cal patients. Following is a preliminary summary of responses to our survey:(8)

San Joaquin	200 of 360 members refuse to accept Medi-Cal. Physicians are less willing to accept them than before. Only 3 physicians are specifically taking new Medi-Cal. Trend down in acceptance of Medi-Cal.
Placer-Nevada	Very few taking new Medi-Cal. GPs not taking Medi-Cal but specialists are. Some are referred to Sacramento or go to Roseville Hospital emergency room. Physicians are very busy--4 week wait for private patients. None will take new Medi-Cal in Auburn area. Nevada County doctors taking fewer patients. Some go to emergency room. Fewer OB services available. OB-GYN not taking Medi-Cal in Nevada County.
Tulare	Most not taking Medi-Cal. Many are not taking new patients.
Yuba-Sutter-Colusa	The number of physicians taking private patients is normal but Medi-Cal is low. In Colusa only one physician will deliver and about half doctors take no Medi-Cal (6 of about 12).
Chico	10 have refused to take new Medi-Cal.
San Luis Obispo	Few taking new Medi-Cal. Only 1 OB takes Medi-Cal.
Humboldt-Del Norte	Difficult to find physician who has been accepting Medi-Cal since November. Multi-physician clinic accepting 1 Medi-Cal for every 2 non-Medi-Cal 7 physicians are taking new Medi-Cal plus an additional 7 through the clinic waiting list. If there is no relief in the Medi-Cal payment structure, patients will have to be sent to other areas for treatment. Anticipate closure of County Medical Center.
Shasta-Trinity	Most not taking Medi-Cal. 2 GPs will see Medi-Cal. Most specialists will take all patients.
Mendocino-Lake	Many are becoming more selective about Medi-Cal. Access to care could be problem in Lake County. 2 OB men near Fort Bragg not taking Medi-Cal.

Merced-Mariposa	Medi-Cal is serious problem. Primary care physicians will generally not see them. Only 2 will. Many go to the clinic or are treated at Merced Community Hospital. Medi-Cal OB care is a very serious problem. Hospital anesthesiologists will only treat Medi-Cal emergencies. Medi-Cal has been problem for the last year to 18 months.
Lassen-Plumas-Modoc-Sierra	4 have refused Medi-Cal. Decrease in OB service in Modoc and Sierra. In Plumas, physicians are treating them.
Siskiyou	Many are refusing to accept Medi-Cal. One or two in southern part of the county are still taking them.
Tehama	Most not taking new Medi-Cal. Trend on acceptance is down.
San Benito	Some specialists prefer not to take Medi-Cal.
Yolo	Reluctance to take Medi-Cal has increased since malpractice rates went up.
San Mateo	Physicians have generally not been willing to take Medi-Cal. Medi-Cal OB patients are referred to Chope Hospital. Many will only take Medi-Cal on referral.
Santa Clara	In response to a survey of 752 respondents, 110 physicians said they take no new Medi-Cal 113 said they reduced their Medi-Cal; 22 said they discontinued all Medi-Cal, and 31 said no new patients. Obtaining OB care is becoming a serious problem. Trend in acceptance of Medi-Cal is down.
Marin	Less than 5% of physicians will take new Medi-Cal. Only 3 GPs. Specialists usually take Medi-Cal on referral only. Medi-Cal patients are sent to San Francisco or to the few physicians who still see them.
Stanislaus	Very few physicians accepting Medi-Cal. Only 5. Many patients go to emergency room. Trend in accepting Medi-Cal is down. Some go to Scenic General Hospital.

Inyo-Mono	1 or 2 physicians from Mammoth Lakes have eliminated Medi-Cal patients from their practice.
Napa	10 taking Medi-Cal.
Sonoma	Hardly any taking Medi-Cal.
Sacramento	Many Medi-Cal patients are calling for referral and physician willingness to accept them is becoming more of a problem.
Butte-Glenn	10 have refused to accept Medi-Cal. Particular problem with OB services.
Alpine	Malpractice problem has made it more difficult to get care for Medi-Cal especially OB. No physicians in Alpine, but care in service areas less available.
Calaveras	1 doctor doing OB. Medi-Cal patients can be served through local hospital.
El Dorado	About 80% of physicians not accepting new Medi-Cal. One GYN in Placerville will see Medi-Cal. OB particular problem.
Tuolumne	Greater reluctance to see Medi-Cal. Many will not accept new ones and they go to the County Hospital. OB a problem.

Thus, although recent statewide evidence of the impact of malpractice premiums on physician provider participation statewide is inconclusive, physician surveys and reports from Medical Societies indicate fewer physicians appear willing to accept Medi-Cal patients. On the other hand, preliminary evidence from San Francisco and the East Bay appears to show no downturn in recipients or visits.

Availability of Care

Preliminary evidence indicates that rural areas, more heavily served by family physicians, are more severely impacted by changes in the scope of physician practice most likely making surgery and obstetric care less available. These are the areas primarily affected as will be premature retirements and the areas having traditional problems attracting physicians.

A third of all CMA survey respondents said that changes they were making or planning *would* affect the availability of care in their community. However, about 60% of the *non-metropolitan respondents* said they were making practice changes and half of these total respondents (almost 85% of those making changes) said the changes would affect the availability of care in their areas.

Some of the affected rural areas are also those subject to recreation and vacation influx, and have small hospitals which may have already been or could soon be affected by changing practice patterns. According to the President of the Inyo-Mono Medical Society:

> "Normally many skiers injured at Mammoth are treated in Bishop, and those are the people who will be treated in a first-aid fashion only and sent on to Los Angeles or other areas for definitive orthopedic treatment which they could very well have had except for the malpractice crisis. The recent slowdown in orthopedic surgery has considerably reduced the hospital census and the Board of Directors and Administrator anticipate short work weeks and/or lay-offs in January."

The Secretary of the Lassen-Plumas-Modoc-Sierra Medical Society comments:

> "...several of our small hospitals in the area are in danger of closing--and it is difficult to attract new doctors to replace those who have left."

The Executive Director of the Humboldt-Del Norte Medical Society said:

> "In my opinion, Medi-Cal patients will be the classification of patients who suffer most (due to malpractice increases). It is very difficult to find a physician in our area who has been accepting new Medi-Cal patients since the first of November... The Humboldt County Medical Center is scheduled to close before the first of the year. Therefore, there perhaps will be some startling developments within the next 90 days that we cannot predict at this time. If there is no relief in the Medi-Cal payment structure, then the Medi-Cal patients will have to be sent to San Francisco or other metropolitan areas for treatment."

We have previously shown that increases in malpractice rates appear to have had an important impact on the availability of obstetric care. Family physicians are reducing deliveries and some older OB-GYN specialists appear to be dropping OB practice earlier than they might have. Both these trends, when combined with the large difference between Medi-Cal reimbursement and private fees, increase the reluctance of physicians to serve Medi-Cal patients. This problem hits rural areas hardest and suggests the need for other forms of OB services in rural communities. They also suggest the desirability of establishing different rates for rural communites to the extent they are actuarily justified. In the Bay Area, rates for Shasta, Trinity, Solano and Siskiyou counties are about half those charged in Alameda and Contra Costa.

Effects on Fees

The most direct impact of malpractice rate hikes is that they increase the physician's cost of doing business which in most cases is passed on to private patients in the form of fee increases. Respondents to the Auditor General's survey indicate that fees have been increased between 10% and 30% to cover malpractice costs.

A July survey by Johnson and Higgins (9) indicated that Class I physicians (i.e., family physicians, pediatricians, internists and other low-risk specialties) would have to increase fees ranging from about 10% in Yolo County to 60% in Del Norte, with most indicating the range would be from about 20% to 30%. For higher risk specialties in Class IV (i.e., obstetricians, anesthesiologists, neurosurgeons) the anticipated increase ranged from 12% in Yolo to 98% in Fresno, with most indicating a fee increase between 30% and 60%.

Guidelines were developed by the Santa Clara Foundation for Medical Care to help physicians compute fee increases necessary to pass on the cost of premiums to private patients. For example, a low-risk physician earning a gross income of $80,000 with 20% of his gross depending on fixed-fee patients (i.e., Medi-Cal or Workmens Compensation), facing a premium increase of $3,600, would have to raise his fee about 6%. An anesthesiologist facing an increase of $17,200, earning $80,000, with 20% of his patients fixed-fee, would have to raise his rates about 27%.(10) Those physicians with the smallest gross income and heavy fixed-fee patient responsibility face the greatest problem raising fees.

Most physicians appear to be passing all or part of the cost of increased malpractice premiums on to their private patients. Almost half of the respondents to the CMA survey said they had or were passing on the cost and about a fifth had or were planning to pass on part of the cost. However, a small, but significant percent, said they would absorb all the cost.

A number of physicians have chosen to drop their insurance rather than pay increased premiums. In the 23 county Travelers NorCal Mutual area this could be as high as 10% of those covered before the rate increase.(11) The CMA survey reports a smaller statewide percentage of those going without insurance but, when combined with those who said they intended to reduce their coverage, the percentage is slightly higher than the NorCal non-renewals. Physicians who do not obtain coverage face the risk of losing hospital privileges. However, some hospitals, particularly in rural areas, are permitting doctors to practice without coverage (e.g., San Benito Area).

Potential Effects on Physician Location

California is heavily dependent for its physician supply on migration of young physicians who receive their undergraduate medical education in other states. It trains comparatively few medical students but many students educated elsewhere come to California as house officers (i.e., interns and residents). California also does well in retaining its own medical school graduates as house officers. House officers also tend to locate their practice near where they take residencies. (12)

Any significant shifts in migration of physicians to California or out-migration of house officers or other practicing physicians could have a major impact on future supply of physicians in the state. Preliminary, but fragmentary, evidence indicates that no major shifts of physicians has yet occurred which will affect California physician supply in the immediate future. Information supplied by the Board of Medical Quality Assurance indicates that:

- new physician licensees in California during 1975 exceeded that for 1973 and 1974;
- requests by California licensed physicians for endorsements to practice in other states has not shown any significant increase;
- the percentage of out-of-state physicians licensed to practice in California shows no decline between July 1974 and December 1975;
- more California hospitals offering residencies in 1975 were matched with residents they chose than in 1974 and the percentage of those residents sought by hospitals who were matched increased successively in 1973, 1974 and 1975; (13)
- a sample of third-year Family Practice Residents, surveyed by the Health Department's Health Manpower Development Section, indicated that the overwhelming choice of those who had decided on their practice location was to remain in California (26 of 31, had not yet made a practice choice); (14)
- attendance at December FLEX licensing exam in Los Angeles and San Francisco was not significantly lower than the attendance at previous licensing exams.

and Pennsylvania ($1,644 and $16,334). This may indicate that, unless California experience changes substantially, future rates here could grow disproportionately compared to other major states. However, companies writing malpractice insurance in California have not followed ISO suggested rates and may not be likely to follow them in the future, Also actions taken by the legislature, influencing claim cost and the structure of the malpractice insurance system, may improve California's rate position compared to that of other states.

With present data and future uncertainties, it is very difficult to speculate about the effect of liability increases on practice location decisions. It is likely that medical school graduates are looking and will look seriously at the "practice climate" which exists in a state in which they might like to locate in the future and this decision-making process is sure to consider malpractice rates and experience as well as income expectation and other factors. However, many may be impressed with the future uncertainties surrounding rates and not let this factor alone loom too large in their location decisions.

Quality of Care

A recent Rand paper has reviewed the effects of medical malpractice issues on quality of care.(17) The authors suggest that:

- if malpractice premium differentials cause fewer medical school graduates to enter surgery this would be a social good since many surgical procedures are unnecessary and the extent of surgery depends on the number of surgeons in an area;
- high premium rates which discourage part-time practice may improve quality if part-timers are not practicing enough to remain competent or are older and may be less technically competent. However, discouragement of part-time practice may also

It is important to note that the impact of increased liability insurance on location patterns may lag. Also some new physicians may feel that some solution will be found soon or that the situation in California will be no worse than other states in the future.

An important indicator of the possible future impact of premium increases is the differential between rates in California and in other states. A survey of State Medical Societies, conducted in June 1975 by the AMA, revealed that for $100,000/$300,000 limits the only state with higher premiums for low and high-risk coverage than California was New York, but since increases in November 1975 and January 1976 California premiums are now probably higher than the New York June rates. (15) California's June rates for low-risk coverage do not compare unfavorably with those of the 9 other most populous states. For high-risk coverage, most of the large states were lower. Philadelphia Area rates were comparable to California's. Those in the Detroit Area and in New Jersey were somewhat lower, with the other large states considerably lower. (16) Rate increases are pending in a number of large states and the situation seems to be extremely fluid in terms of rates, companies providing coverage and types of coverage provided. The situation is further complicated by legislative enactments in many states which must await review by courts and juries.

One possible indicator of what rates would be in the various states if based solely on experience is the suggested rates of the Insurance Services office, developed from the experience of reporting companies around the nation. Suggested ISO rates as of January 29, 1976, for California are substantially higher than for other states. For example, for $100,000/$300,000 coverage suggested rates for California are $6,074 for lowest risk coverage and $49,417 for highest risk. The next highest rates are those suggested for Michigan ($4,287 and $34,883), Arizona ($3,703 and $30,159), Florida ($2,925 and $28,920) affect competent young female or academic physicians;

- high premiums will encourage less surgery by family practitioners and more by surgeons. "Insofar as the surgery performed by family practitioners is of poorer quality than that performed by surgeons (this is the accepted belief), then the level of quality of care will rise as the general practitioners are drawn out of the surgical market;"
- certain types of specialty care may be negatively affected by high premiums which encourage physicians either to increase the number of risky procedures to increase their income or to eliminate those procedures altogether. This could result either in unnecessary surgery or in reducing the availability of certain services and increasing risk to patients who might have to be transported;
- if physicians are encouraged to join health maintenance organizations (HMOs) rather than solo practice, this could result in slight improvement in quality since HMOs "probably deliver slightly better care, on the average, than does the fee-for-service system."
- there is little evidence concerning the impact of so-called "defensive medicine" on quality of care. Increased tests or procedures may or may not be necessary depending on the criteria applied to evaluate their utility. According to some process criteria, too few procedures may be performed;
- effects on the traditional doctor/patient relationship may have positive or negative results. To the extent it encourages patients to take greater personal responsibility for their care, it may be a social good.

- the quality of the care medicaid patients receive may be affected if significant numbers of physicians refuse to treat them, spend less time with them, or order unnecessary procedures.

Malpractice rate increases may have both negative and positive effects in rural areas. Previously noted reports from rural communities indicate that certain types of care may be less available as a result of malpractice inspired premature retirements, and changes in the spectrum of services available. Also, the California Academy of Family Physicians has expressed concern about the impact of premium rate increases on Family Practice in rural California. In recent correspondence, the Executive Secretary of the Academy noted:

> "We are deeply concerned about the impact on the field of family practice. Our residents throughout the state are expressing concern over spending a great deal of time training, particularly in such areas as OB, when they won't be able to include this in their practice. This will hit rural areas hard because these are the very areas that require the broadest type of training and service." (17a)

If family practitioners are discouraged from doing procedures they are technically competent to perform, then the level of care in the community may be reduced and inefficiency encouraged. However, reduction of certain surgical procedures by part-time, less technically competent practitioners in small hospitals, may have positive effects on the quality of care, particularly if more technically competent specialty care is available within a reasonable distance and is accessible. Also malpractice premium increases in rural areas may have the effect of encouraging greater specialization of care through the process of referrals to physicians who are encouraged to perform enough procedures to maintain a higher level of competence. A negative effect could be that some minor surgical procedures could be referred to distant specialists, with resultant inefficiency in delivery of care, inconvenience and increased costs. In rural areas with few physicians to cover large geographic areas (which may be snowed in during the winter) and part-time practice, hardships may occur which call for corrective action.

Effects on Physicians Assistants

Data obtained from a 1971 AMA survey suggests that malpractice premiums themselves do not significantly influence physicians' willingness to utilize allied health personnel in their office.

The current premium rate structures themselves appear not to be a barrier to hiring of PAs. The Doctor-owned Medi-Cal Insurance Exchange charges $124 extra a year for covering a PA, and NorCal and Travelers charge nothing.

Johnson and Higgins, brokers for the NorCal Mutual and Travelers plans indicate significant increase in recent applications by physicians to cover PAs.

Conclusions

Our preliminary analysis, based upon statewide surveys focused primarily on Northern California data, suggests that major increases in malpractice rates have:

1. not yet caused a major movement of physicians out of California;
2. not yet caused reductions in the annual number of new physicians licensed to practice in the state;
3. not yet caused reductions in the number of out-of-state licensees;
4. not yet caused an increase in the number of endorsements by California physicians to practice elsewhere;
5. not yet resulted in encouraging graduating California family practice residents to leave California and set up practice elsewhere;
6. not significantly reduced physician willingness to utilize physicians' assistants;
7. not yet resulted in significantly reducing the number of physician providers serving Medi-Cal patients up through November 1975,
8. not resulted in significantly reducing the availability of physician care to Medi-Cal patients in San Francisco and the East Bay after the May physician slowdown;
9. apparently not resulted in discriminatory treatment by Bay Area physicians of Medi-Cal patients needing hospital care during the May physicians' slowdown;
10. probably encouraged premature retirement of a few, but not an overwhelmingly large number of, older physicians--many of whom may have been practicing part-time;

11. probably significantly affected the spectrum of services provided, particularly by family practitioners, many of whom indicate they have reduced surgery and obstetrics and by other specialists who appear to have reduced surgery;
12. caused frustration among family practice residents who are discouraged from performing obstetrics and other procedures for which they received residency training;
13. probably reduced the availability of care in certain rural areas, particularly obstetric care and services to Medi-Cal patients;
14. resulted in increased expression by physicians of their unwillingness to accept new Medi-Cal patients and reports by Medical Societies and public officials that few physicians in many Northern California areas are accepting Medi-Cal patients without referrals;
15. potentially improved quality of care to the extent that unnecessary surgery is reduced and less technically competent physicians are discouraged from performing surgical procedures in poor facilities;
16. resulted in increased costs of service ranging from 10% to 30% for office visits to primary care physicians and more for surgery and specialty care. Most physicians appear to be passing all or part of their increased premium costs on to private patients;
17. encouraged a small but significant number of physicians to practice without insurance (probably between 5% and 10%).
18. probably in metropolitan areas stimulated a transfer of certain patients from family physicians to surgeons and obstetricians;
19. caused many physicians who have not made changes in their practice to consider doing so if rates continue to climb;

20. probably, to a minor degree, helped increase the attractiveness of closed practice settings although salary increases were probably a more important incentive to those moving to military service than the disincentive of higher premiums.

In sum, available evidence suggests that malpractice rate increases have not yet caused significant reduction in California physician supply, but appear to have spurred changes in practice patterns with potentially important effects on the availability, cost and quality of care, particularly in non-metropolitan areas. These effects should be carefully monitored so that their impact statewide and in particular areas of California can be appropriately assessed by policymakers.

Policy Implications

Many physicians appear to be riding out the initial malpractice storm, some having increased their fees to absorb increased costs and some having made practice changes to reduce them. Many are probably hoping for some legislative relief while they ponder their options for the future. If rates continue rise substantially, then increased medical costs and perhaps more substantial practice changes will result.

Even though Medi-Cal recipients are obtaining access to care, it does appear that many physicians are becoming more reluctant to treat them due to increased disparity between fees charged to private patients and Medi-Cal reimbursement. Consideration should therefore be given to bringing Medi-Cal physician reimbursement more in line with charges paid to private patients. Efforts should also be made to assure that obstetric care is available to those in rural areas. In some areas increased use of nurse midwives could fill this need.

In addition, consideration should be given to making the rate structure more flexible to not discourage 1) rural and part-time practice by competent physicians; 2) family practice physicians and other specialists from doing those procedures they are trained and technically competent to do, and 3) new physicians from locating in California. (18)

Recommendations for Further Research

We recommend that the following research be undertaken to more thoroughly document the effects of malpractice rate increases:

1. monitor trends in Medi-Cal physician provider participation and in their acceptance of new Medi-Cal patients to determine if shifts in availability andaccessibility of care is occurring;
2. monitor trends in Medi-Cal patient census in county and community hospitals to determine if Medi-Cal patients are being increasingly admitted to county facilities;
3. monitor trends in selected surgical procedures and obstetrics by specialty and area to determine if changes in number of procedures or in type of physician performing these procedures is changing;
4. compile and analyze statewide data from malpractice insurance companies on the extent to which physicians are changing premium class and why;
5. collect and analyze data on selected surgical and obstetric procedures to determine if any reduction in number or change in physician specialty performing them;
6. analyze data from recent California physician relinceneure and accompanying survey to determine changes in supply and distribution of physicians;
7. to the extent possible, complete and analyze data on residency location choices of interns and residents to determine if California

is as attractive a place for location as it has been in the past;

8. survey California house officers to determine their practice choices and the extent to which malpractice may significantly influence that choice;
9. monitor malpractice rates in other states. Apparently no central repository exists for collecting rates by state;
10. develop a continuing survey of physician practice patterns on a sample basis to detect changes over time and on a timely basis.

FOOTNOTES

1. Report of Booz-Allen Consulting Actuaries contained in Joint Legislative Audit Committee, Office of the Auditor General, Report No. 265-2, Doctors' Malpractice Insurance, December, 1975, p. 16.

2. Op. Cit. Auditor General's Report, p. 22.

3. Family physician as used in this report includes general practitioners and family practitioners.

4. This survey was taken in August before premium increases actually took effect in most of the state.

5. Sample of 1,000 with 778 responses compared to Auditor General's survey with a sample of 540 and 270 responses.

6. Reduction of surgery by general practitioners is not a new phenomenon, but has been speeding by rate increases.

7. CMA Socioeconomic Report February/March 1975.

8. Our survey responses are supplemented when appropriate by data from January 1976 Health Department telephone surveys of Medical Societies and rural health officers or their designees.

9. Brokers for the Travelers insurance program in 23 non-Bay Area Northern California counties.

10. Material prepared by Dr. Robert D. Burnett, President of the Santa Clara Foundation and sent to Foundation physicians.

11. This is the number of non-renewals by physicians in the area.

12. Among the 43 states with medical schools California in 1973-74 ranked 8th per 100,000 population in total number of house officers and house officers from another state, and 13th in number of house officers from the state who remained there. California also ranked 35th in number of 1973 entering medical students per 100,000 population.

13. It is important to also note that the number of residents sought by hospitals declined between 1973, 1974 and 1975.

14. A survey of all third-year family practice residents is now underway.

15. See Malpractice in Focus, The American Medical Association, August 1975.

16. Following is the ranking of the states by population: California, New York, Pennsylvania, Texas, Illinois, Ohio, Michigan, New Jersey, Florida, Massachusetts.

17. Robert H. Brook, R.L. Brutoco and Kathleen N. Williams, "The Relationship Between Medical Malpractice and Quality of Care," October, 1975, p. 5526 The Rand Corporation.

17a. Letter to Author, January 16, 1976.

18. As mentioned earlier, Argonaut charges lower rates to rural county physicians. NorCal Mutual is now considering such a plan. Both the Medical Insurance Exchange and NorCal Mutual plans provide for reduced rates for part-timers. Medical Insurance Exchange and NorCal Mutual provide for a 50% rate for the new physician during his first year in practice.

3. THE IMPACT OF NATIONAL HEALTH INSURANCE

The optimal policy with respect to the support of and influence on the training of physicians by the State of California in response to the passage or in preparation for the expected passage of National Health Insurance will depend to a considerable extent on the following factors:

1. Current Demand for Physician Services and the Capacity to Provide Them
2. The Particular Form of the National Health Insurance Legislation Enacted
3. The Responsiveness of Real Consumer Demand to Changes in Financing Mechanisms
4. The Capacity of Physicians to Respond to an Increased Demand for their Services
5. The Influence of Supply Characteristics on the Availability of Utilization of Services.

We will discuss each of these factors and we will also provide preliminary projections of the utilization of physicians' services and the capacity of physicians to provide services following enactment of National Health Insurance.

1. CURRENT DEMAND FOR PHYSICIAN SERVICES AND THE CAPACITY TO PROVIDE THEM

Estimating current demand or predicting future demand for physician services continues to rest on the tightrope between art and science. Few areas cause more disagreement than such projections.

In attempting to determine demand for physician services, one must be cautious to distinguish between the concepts of need and demand. Need is an estimate of the quantity of medical services that ought to be consumed in order for a population to be as healthy as medical services can make them. It is based on the opinion of physicians or other experts. These standards change as medical knowledge advances and as concepts of adequate medical care are revised. The need, as estimated by experts, always exceeds public demand for medical services.

The demand for medical care relates to the actual use of services. Demand arises from a variety of factors, particularly those perceived by the consumer as important, and is backed up by an ability and willingness to pay for health services.

Because of the need to estimate physician requirements with a reasonable degree of accuracy, a variety of methods have been developed in recent years that have produced widely different estimates of demand for physicians and have identified different geographic areas as possibly underserved. The models most generally applied to forecast physician requirements include:

--approaches based on professionally defined criteria;

--methods based on current utilization rates of health services by a defined population group with access to comprehensive health services, as exemplified by group practice - prepaid health care plans;

--techniques using physician/population ratios; and

--economic methods, including econometric modeling.

For the purposes of our discussion, we will emphasize the complexity of attempting to estimate demand, regardless of which methodological approach is chosen, rather than describe the specific elements and problems associated with each model.

Demand is determined by the interaction of many variables which are often as difficult to measure as demand itself. In addition to the individual preferences and socioeconomic status of the consumer, demand is a function of the organization of the medical care, the numbers and types of available practitioners, the prices of services, the scope of health insurance benefits and the impact of malpractice.

Demand for medical care services cannot be easily separated from the supply of health manpower because of the importance of the physicians in determining demand for care. Since physicians play a central role in generating demand for their own and related health services and are encouraged to provide services by the economic inccentives of the fee for service system, the medical care system is capable of absorbing increasing number of physicians into desirable urban areas while, at the same time, making access more difficult for people in rural or less attractive urban areas.

The market mechanisms in medical care do not function to properly balance the supply of'physicians and other health personnel with the demand for services. In response to this failure of the market mechanism an increasing number of Federal and State policies to address health manpower issues have been developed, while financing policies have remained unchanged. It is interesting that more and more attention has been focused on the role of the medical school in meeting the problems of geographic and specialty maldistribution, when one of the major culprits, in our view, is the current physician reimbursement policies based on usual and customary fees.

There are three flaws in the present system of physician reimbursement in most private insurance programs, as well as in Medicare and MediCal. First, physicians who do procedures, whether these are surgical or medical, such as gastroscopies and electrocardiograms, are compensated at far higher rates than physicians who devote their time to basic, primary care services. Second, urban based physicians receive higher fees than physicians in small towns and rural areas for identical services. Finally, there is no reasonable way to control the cost of physician services or those services or those services directly controlled by the physician without increasing regulation. This will lead to more and more effort on the part of government to regulate both the fees charged by physicians and the services they render.

Accepting the structure and components of the medical care system as static facilitates the estimation of demand for services by allowing projections based on the current technology, the organization of services, methods of financing and patterns of utilization. Such projections are limited, however, because of rapidly changing technology and the dynamics of the system, especially in this period of increasing national concern regarding access, cost and quality. The national commitment to equitable access to health care as the right of every citizen requires that estimates of demand be adjusted to account for current underutilization of medical care services. The critical issue in identifying underserved populations is the development of criteria which are sensitive to the complex array of factors which limit accessibility to medical care services. Defining the area and the population to which such criteria are applied is a second critical decision since the types of areas chosen (such as market area vs. arbitrary political boundaries) will yield substantially different results.

Even if market areas of available services could be defined, measures such as the physician/population ratio, when applied to such areas, have inherent limitations in identifying populations to which access to care is restricted. First, a consensus has yet to be reached on a ratio which represents an adequate physician supply to meet the population's medical care needs. Moreover, a population's needs are a function of a unique combination of variables just as medical manpower "shortages" are a reflection of many factors, including population density and per capita income.

Rural underserved areas vary greatly from one part of the country to another in the demographic and cultural characteristics of the people living in the area, the extent of poverty, the importance of climatic factors, geography, the size of communities and the local resources that can be brought to bear on the problems. Criteria originally developed to detect rural health manpower deficiencies often are not appropriate for identifying urban underserved areas. Since these areas are usually pockets within adequately supplied--or even oversupplied--urban areas, the criteria applied must account for very different factors than physician to population ratios. The factors which limit accessibility of inner city populations, and thus cause them to be identified as underserved, involve a complex array of socioeconomic and cultural problems associated with urban inner city life which are often more compelling than the unavailability of health professionals and other health care resources.

The demand for medical care by a population and the supply of health manpower available to that population are reflected in the utilization of medical or health services. Studies by Held and Reinhardt (1) have found that, on a national basis, the medical care system tends to respond to demand in a manner that offsets differences in the physician per population ratio. Earlier studies by Reinhardt (2) revealed some of the reasons for this. By seeing more patients per hour and per day, working longer hours and employing more paramedical personnel, physicians in areas with fewer physicians in relation to the population compensate partially for their fewer numbers. By these means they may see twice as many patients in a year as their suburban counterparts. Patients in many of these areas do not wait any longer to see a physician, whether they are an old or a new patient, than do people living in areas well supplied by physicians. The higher fees charged in the more attractive locations allow physicians to meet their income aspirations while seeing fewer patients and working shorter hours. Because physicians decide when their patients will use various health services, an oversupply of physicians tends to generate an overutilization of other health services, including inpatient hospital care. To date, there has been no evidence of a saturation point in the physician market.

The recently completed National Ambulatory Medical Care Survey also showed virtually uniform rates per person per year for physician office visits across the four major census regions of the United States. One of the questions that cannot be answered by this data, is how well these people are served. In spite of this, the studies do reveal great flexibility on the part of the medical care system to respond to demand and they raise serious questions about some of the current methods used to estimate needs for physicians.

2. THE PARTICULAR FORM OF THE NATIONAL HEALTH INSURANCE LEGISLATION ENACTED

Many basic issues must be faced in defining National Health Insurance proposals. There are four of those issues which will be of particular importance to the determination of manpower policies. They are (1) the services to be covered; (2) the extent to which patients share in costs; (3) who is eligible to be paid for providing medical care services and the mechanisms by which providers are reimbursed for services provided; and (4) controls over aggregate expenditures. We will use three proposals to illustrate the responses to those issues. They are the Comprehensive Health Insurance Plan (CHIP), the Health Security Act and the Long-Ribicoff Catastrophic Health Insurance and Medical Assistance Reform Plan.

CHIP was the proposal favored by the Ford Administration. It would require employers to provide private health insurance with at least minimum levels of comprehensive coverage for employees, assist low-income and high medical-risk populations to get basic insurance coverage, and slightly change the Medicare program. The employee plan would have a deductible of $150 per person and 25% coinsurance, but total cost sharing was limited to $1,500 annually per family or $1,050 per individual. The assisted plan would have similar maximum cost sharing provisions but with amounts reduced according to individual or family income. Medicare co-payments were slightly lower than those for the employee plan with an adjustment for the low income aged.

Coverage under CHIP was comprehensive including inpatient and outpatient hospital care, up to 100 days per year in a skilled nursing facility, physician services (excluding preventive care for adults), dental care for children under 13 years, eyeglasses, hearing aids, eye and ear examinations for children under thirteen, home health care up to 100 visits per year, regulated fertility related services, and limited mental health services. Standards for providers would be similar to those under Medicare with provisions made for expanded participation of optometrists and dentists and establishment of standards for physician extenders. Reimbursement rates would be established by the states according to Federal procedures and critieria and the option to enroll in prepaid practice plans would be encouraged. No specific reference is made to aggregate expenditure control in the legislation but the approach taken is one of dependence of cost sharing requirements for employers, employees, states and the Federal government to limit those expenditures.

The Health Security Plan has been particularly associated with Senator Kennedy and Representative Corman and supported by the AFL-CIO. There would be no co-payments for covered service which would be extensive. They would include hospital services, skilled nursing facilities up to 120 days per year, physician services including physical checkups, dentists for children under age fifteen with specified plans for extension to age 25 and eventually the entire population, fertility related services, home health services, regulated optometrists services and eyeglasses, limited prescription drugs and mental health services.

Standards for providers would be the same as under Medicare, but with additional requirements. Physicians would have to meet national standards and major surgery could be performed only be qualified specialists. Physicians and other providers could receive reimbursement by fee-for-service based on a fee schedule, per capita payment for persons enrolled, and full- or part-time salaries. Health maintenance organization and medical society foundations would be encouraged. A national budget would be established whose growth would be related to changes in the Consumer Price Index, population, and the number and capacity of providers.

The Long-Ribicoff Catastrophic Health Insurance and Medical Assistance Reform Plan is a two part program. The first part has the same types of benefits as Medicare, but payable only when expenses reached specified catastrophic proportions. For example hospital coverage would begin after 60 days of care with a $21 per day co-payment. Personal services would be payable after a family had incurred $2,000 in medical expenses in a year and include a 20% coinsurance. The total coinsurance would be limited to $1,000 annually per person. The Medical Assistance plan would apply to families with income below specified amounts, which vary by family size, regardless of age or employment status of head. Those persons now eligible for Medicaid would automatically be covered and the plan would also cover families with incomes above the specified limits under a "spend-down" provision that would take into account both family income and medical expenses.

Other provisions are basically the same as under Medicare. However an effort would be made to encourage the improvement of private health insurance plans.

3. THE RESPONSIVENESS OF REAL CONSUMER DEMAND TO CHANGES IN FINANCING MECHANISMS

Projecting demand for physician services under alternative National Health Insurance schemes requires determination of how utilization will be altered by currently active consumers and increased for underutilizers of services. Among the most important factors influencing the change in demand for physicians' services are:

--the proportion of the population covered by insurance and government programs;

--the scope of services covered by insurance and government programs;

--the extent to which coinsurance and deductibles are utilized to constrain demand;

--the response of consumers to the change in praice for a given health care service.

A first step in determining the impact of a National Health Insurance scheme is identification of the proportion of the population already covered under government programs and private insurance,the scope of coverage and the out-of-pocket expenditures by individuals. The Social Security Administration estimated that 76% of the United States civilian population were covered for hospital care under private insurance plans at the end of 1973, 75% were covered for surgical services and in-hospital physician visits, 34% for physician office and home visits, 10% for dental care, and 6% for prescription drugs.(3) Private health insurance accounted for 35% of hospital care payments and 37% of payments for hospital services and 24% of the payments for physician services.(4) They also estimated that 10% of hospital care payments, 39% of payments for physician services, 86% of payments for dental services and for drugs and drug sundries came directly from the patient in fiscal year 1974. Government paid for 38% of expenditures for hospital care, 24% for physician services, and 8% of expenditures on drugs and drug sundries. Medicare and Medicaid each provided about 30% of public expenditures. (5)

An expanded Federal role in financing medical care will have differntial effects on different services and in different geographical areas. Although a smaller proportion of Californians under age 65 seemed to be covered by private health insurance in 1973 than persons in the United States as a whole. (Table III-1) The impact of National Health Insurance may be less than in other areas because of the scope of the MediCal program.

TABLE III-1

Health Insurance Coverage in California and the United States, 1973

Type of Coverage	Percent of Persons Under Age 65	
	California	United States
Hospital	88.2	90.3
Surgical	76.4	84.6
Regular Medical	7[illegible].7	75.9
Major Medical	48.3	43.1

Source: Bureau of Research and Planning, California Medical Association, Socioeconomic Report (August/September 1975)

However, the Medicaid program in California has wider coverage and greater benefits than programs in most other states. In 1970, the ratio of Medicaid recipients under age 21 to poor children was 0.55 for the United States and 1.33 for California. Medicaid payments per poor child were $69 for the United States and $168 for California. Similarly the ratio of recipients, age 21-64, to poor adults was 0.61 and 1.73 for the United States and California, respectively, while payments per poor adult was $250 for the United States and $672 in California.(6) Not only is medical coverage more comprehensive than in most other states, Californians spend more money out-of-pocket for medical care than do residents of most other states. According to estimates of the Social Security Administration, about 25% more per capita was spent on personal health care expenditures for Californians in fiscal year 1969 than the per capita expenditures for the entire United States population. Out-of-pocket payments were about $135 per capita for California, ($102 per capita for the United States, and falling as low as $55 per capita for Mississippi.(7)

The exact number of persons in California not covered by private insurance who fail to satisfy eligibility criteria for government programs is unknown. They would be the temporarily unemployed, farmers, small businessmen, independent professionals, and low paid employees or independent workers, whose only option is to purchase an expensive individual health insurance policy, and women who are not wage earners but have principal responsibility for caring for their families. While an expanded national program would introduce hospitalization coverage for these persons, a greater potential for improved coverage of the entire population exists for surgical services and other hospital based physician services. Furthermore, the greatest room for expansion exists for the coverage of ambulatory physician care and specialized services such as dental care, prescription drugs, optometric services, and mental health services.

Given the degree to which coverage is expanded and improved, the increase in demand will depend on the extent to which users of health care desire to increase their utilization when provided with reductions in the out-of-pocket payments they must make for that use. It is possible that the desired increase in ambulatory services will not occur because of inadequate supply. This could lead to rationing through a variety of mechanisms such as delays in appointments, longer waits in physicians offices, a reduction in the time spent with the patient, reducing the revisit rate, and/or handling more cases over the telephone or by hospitalization. The degree to which these mechanisms will be called into play in California is unknown. In economic terms, the response depends on the elasticity of demand with respect to price. That is, an elasticity of -.50 indicates that a 50% reduction in price would lead to a desired increase of 25% in the utilization of services. Without going into details at this time, it is enough to say that there is considerable disagreement among analysts as to the probable elasticities. Kimbell and Yett have recently prepared an extensive review of the empirical estimates.(8) There appear to be variations in the responsiveness for different categories of health care services, and between different population subgroups because of socioeconomic factors. For certain types of care, such as hospitalization, physicians are the primary decision makers with respect to the quantity used. In other areas, such as dental care, the patient plays the primary role and is more sensitive to direct costs.

A recent study by Newhouse, Phelps and Schwartz has provided estimates of the impact of some general National Health Insurance plans on the demand for services.(9) We will summarize their finding:

1. A full coverage plan for hospital inpatient services would expand demand by approximately 5% to 15%. The anticipated change in demand for inpatient services from a 25% coinsurance plan would be between 0% and 8%. Inclusion of a small deductible ($50 or $100 per year) would cause an increase in demand for hospital services little different from that of full coverage.

2. For ambulatory physician services, it is conservatively estimated that a full-coverage plan would increase demand by 75% and that a 25% maximum coinsurance plan would increase demand by 30%. A quite small deductible (such as less that $50 per person per year) would not likely have an effect on demand different from a full-coverage program. However, a somewhat larger (but still relatively small) deductible, is likely to influence demand markedly. Unfortunately, the exact size of the deductible which would begin to have a marked effect could not be specified.

Recently HEW estimated a short-run increased demand for outpatient services under National Health Insurance of 25%.(10) In addition, HEW has made estimates of the overall increase in health care expenditures which could be expected in 1975 from the enactment of specified National Health Insurance proposals.(11) With no National Health Insurance plan, expenditures were projected to be $103 billion. The Administration plan, CHIP, was estimated to lead to a 6.3% increase of expenditures to $109.5 billion, the Health Security Act was estimated to induce a 13% increase of expenditures to $116 billion, and Long-Ribicoff was estimated to lead to a 4.3% increase to $107.4 billion.

In Canada, the effect of comprehensive coverage of physicians' services has not been pronounced. In Quebec, for example, the introduction of uniform compulsory health insurance for physicians' services increased demand by only 7% between 1971 and 1972. The extreme variation in these findings makes it difficult, at best, to reach agreement of how a National Health Insurance scheme will influence demand.

4. THE CAPACITY OF PHYSICIANS TO RESPOND TO AN INCREASED DEMAND FOR THEIR SERVICES

Although we cannot currently project with certainty the magnitude of change in demand for services under National Health Insurance, it is likely that such a program will further increase demand for services. Whether this increase in demand must be translated into a need for additional physicians depends in part on the size of the already projected supply and in part on the ability of physicians and other health care personnel to expand services. The nationwide increase in medical school enrollments since 1970 has not yet had an impact on the total system or office based medical care because of the length of the training process.

The potential impact of these enrollment increases is evident in the HEW projections of future physician supply. In 1970, there were 263,200 graduates of U.S. medical and osteopathic schools classified as active physicians. This number increased to an estimated 291,500 in 1975 and HEW projects increases to 314,800 in 1980 and 429,800 in 1990. The active physician to population ratio increased from 129.2 physicians per 100,000 population in 1970, to an estimated 135.7 in 1975 and it is expected to increase to 147.5 in 1980 and 171.5 physicians per 100,000 population in 1990. If the present rates of Foreign Medical Graduate (FMG) immigration continue the number of active physicians, including U.S. and foreign medical graduates, will rise from 323,200 in 1970 to 446,800 in 1980 and 593,800 in 1990. The physician to population ratios would rise from 158.6 physicians per 100,000 population in 1970 to 196.9 in 1980 and 236.9 in 1990. Under the assumption that California would maintain its present proportion of the national physician supply, its total active physician to population ratio would increase from 194 in 1970 to 250 in 1990.

The total number of primary care physicians including general and family practitioners, internists and pediatricians is projected by HEW to increase from 118,640 in 1970, to 157,550 in 1980 and 203,850 in 1990. The ratio of those physicians to population will rise from 58.1 per 100,000 in 1970 to 67.1 per 100,000 in 1980 to 76.6 per 100,000 in 1990.(12)

Again assuming that California maintains its same proportion of those physicians, the primary care physician to population ratio in the State would move from 75 per 100,000 population in 1970 to 90 per 100,000 population in 1990.

In addition to the increased number of primary care physicians several other factors must be considered in relation to the ability of the State to respond to the increased demand for health care services that will follow enactment of a National Health Insurance plan.

First, recent studies indicate that there may be considerable flexibility in the number of patient visits handled by a physician. The AMA Periodic Survey of Physicians for 1973 showed a range in the average number of total patient visits per week for all specialties surveyed from 113 in the Middle Atlantic Census Division to 183 in the East South Central Census Division, with a national average of 138 visits.(13) Reinhardt and Held have concluded from their preliminary analysis of a nationwide survey that there is a remarkable degree of flexibility in the link between health service utilization and health manpower requirement and that interregional differences in physician productivity appear to be systematically related to differences in health manpower endowments.(14) The variance in office visits provided by physicians can be related to the number of other personnel aiding them, the time spent with each patient, and the organizational forms - solo or group - in which they practice. However, we do not have any evaluation of how the complex interface between those factors impacts on the quality of care provided.

The AMA survey also indicated that, nationwide, general practitioners averaged 190 total patient visits per week and internists averaged 127 visits per week. The average number of office visits was also far higher for the general practitioners, averaging 145.5 per week compared to the internists 79.4 office visits per week.(15) Although the recent National Ambulatory Medical Care Survey revealed a lower number of office visits per week to general practitioners, they still averaged 118 office visits per week while internists averaged 82 office visits per week.(16) The evaluation of the State's ability to meet the increased demand for care, particularly office based or ambulatory care, that will follow the enactment of National Health Insurance must take account of these marked differences in patient visits per week.

5. THE INFLUENCE OF SUPPLY CHARACTERISTICS ON THE AVAILABILITY AND THE UTILIZATION OF SERVICES

As the financial barriers to utilization are eliminated, the location, mix and practice patterns of the providers of care will play an increasingly important role in the determination of who receives medical care services and the type of services provided. Both the equity and effectiveness of a national financing program will be affected by those aspects of the supply of providers.

Our experience with Medicare has provided adequate evidence of the impact of the availability of services on utilization. Karen Davis has pointed out that,

> Despite the national uniformity policy of the Medicare program, there are substantial variations in benefits by location. Elderly people in the West, for example receive 45% more in Medicare payments per person enrolled

> than the elderly in the South. About one-fourth of this difference is accounted for by regional medical price differences, while the rest reflects the lower utilization of medical services by the elderly in areas with few medical resources per capita. Urban-rural differences are similar. Those eligible for Medicare benefits in non-metropolitan counties received $280 per per person in 1971, compared with $395 for those in metropolitan counties.(17)

The availability of primary care physicians and other primary care providers such as nurse practitioners is the key to access to health care and it is the foundation on which any program of National Health Insurance will ultimately stand or fall. Any attempt to determine the existing number of primary care physicians or to project future physician supply and requirements is complicated by the fact that most physicians in private practice are providing some primary care services. The recent National Ambulatory Medical Care Survey revealed that 40.4% of all office visits were made to general practitioners, 26.3% to medical specialists, 28.5% to surgical specialists--and 4.9% to all other specialists.(18) As recently as 1969, almost 60% of physicians visits other than those to hospital inpatients were to general practitioners and less than 20% were to internists, pediatricians and other medical specialists. Although the increased demand for specialists accounts for part of the displacement of general practitioners by specialists, in some areas it is also related to the relative scarcity of primary care physicians, particularly general and family practitioners. These areas may have a relative oversupply of surgeons and other non-primary care specialists who often provide some primary care services.

A survey published by Medical Economics of physicians in ten specialties revealed that three-fifths of those surveyed were doing some procedures outside of their field. Seventy-five percent of the specialists in rural areas were providing primary care. Perhaps the most interesting finding of the survey were the reasons why certain groups of specialists chose to provide primary care. While some physicians felt it was essential to maintain their ability and stature as "complete" physicians, others were motivated more by economic factors. Young specialists who are not yet fully established supplement their practices with primary care. Older specialists who are phasing down their practices substitute primary care for some more demanding procedures. Physicians in oversupplied specialties often expand the primary care component of their practices. Faced with the threat of malpractice, some specialists prefer providing primary care to performing high risk procedures.(19)

Although these specialists may be meeting some primary care needs, this informal system of primary care should not be perpetuated. The focus of specialty training is inappropriate for primary care; and primary care by specialists raises the cost of services to the consumer.

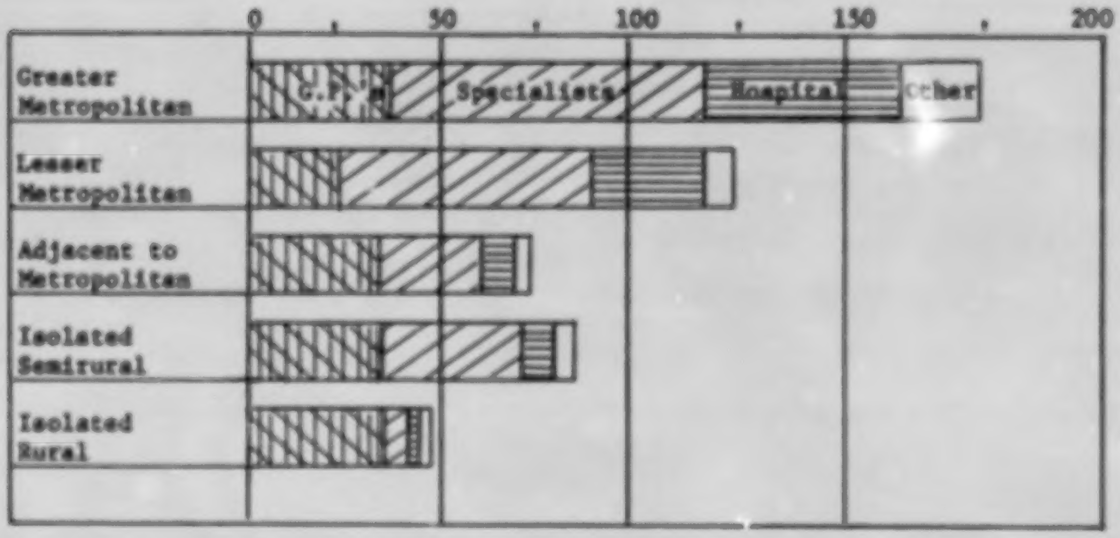
Specialization complicates the problem of geographic maldistribution because specialists and subspecialists tend to settle in areas of large population concentrations. This tendency is reasonable, since these physicians need to serve a considerably larger population than that of the primary care physicians if their services are to be utilized effectively. It has been observed in studies of both geographic and specialty maldistribution that communities seeking physicians are often seeking a primary care physician while physicians seeking practice locations are usually specialists.

To retain access to sophisticated services and consultant opportunites, specialists are attracted to areas near medical schools, teaching hospitals

TABLE III- 2

URBAN - RURAL DIFFERENCES IN PHYSICIAN SUPPLY

Active Non-federal M.D.'s /100,000 Population



Source: DHEW, Health Manpower Sourcebook, Section 18, Manpower in the 1960's. Washington: U.S. Government Printing Office, 1964.

TABLE III- 3

NUMBER AND RATIO/POPULATION OF ACTIVE NON-FEDERAL PHYSICIANS BY GEOGRAPHIC AREA AND MEDICAL SPECIALTY (PREDOMINATELY PRIMARY CARE), CALIFORNIA, July 1969

Specialty	Greater Metropolitan		Lesser Metropolitan		Adjacent		Isolated Semirural		Isolated Rural	
	No.	Ratio	No.	Ratio	No.	Ratio	No.	Ratio	No.	Ratio
*Internal Medicine	3666	31.6	1279	19.7	133	10.0	40	8.0	-	-
**Pediatrics	1402	12.1	575	8.9	55	4.1	8	1.6	-	-
General Practice	4641	40.0	2231	34.4	640	48.0	263	52.6	15	66.7
Total Primary Care	9709	83.7	4085	63.0	828	62.1	311	62.2	-	66.7
Total All Phys.	21977	189.4	9171	141.3	1466	109.9	561	112.2	17	75.6
Pri. Care % of Total	44.2		44.5		56.4		55.4			88
Gen. Practice % of Total	21		24		44		47			88

* also Pulmonary Disease, Gastroenterology, Allergy, Cardiovascular Disease

** also Pediatric Allergy, Pediatric Cardiology

Source: CMA, Characteristics & Distribution of Physicians in California. Feb. 1969 or large, well equipped and well staffed community hospitals. General practitioners and family practitioners are more attracted to towns of 1,000 to 10,000 population than are internists, pediatricians, or other physicians providing primary cares services.(20) The tendency for general practitioners to have a relatively heavier distribution in areas with smaller populations had long existed. The patterns of the 1950s and even earlier periods are still evident in the 1970s.

Data on physician location by specialty in California in 1969 tends to confirm earlier national data that general practitioners are more evenly distributed between urban and rural areas, while internists and pediatricians prefer to settle in greater metropolitan areas. (Tables III-2 and III-3)

We cannot leave the issue of specialty choice and geographic location without mentioning third party reimbursement. Problems of specialty distribution will require changes in reimbursement policies for primary care. Physicians who select specialty practice are currently rewarded by the structure of health insurance payment schemes. Much of the service provided by primary care practitioners is not reimbursedthrough insurance coverage. Modification of Federal and State payment mechanisms to reimburse ambulatory care services at an equivalent level with specialty care would equalize the financial incentives for entering primary and specialty care and thus have a major impact on elevating the status of primary care among medical school graduates. In addition, the training of primary care physicians would be greatly facilitated if medical schools and their affiliated teaching institutions could receive full reimbursement for the cost of the primary care services provided in their ambulatory facilities. Currently, the resident in specialty training can help pay his way through providing reimbursable specialty services to patients who are hospitalized. If the same were true of the primary care resident providing ambulatory care the reluctance of schools to train these physicians would be reduced.

The great increase in internists and pediatricians projected for the future by DHEW suggests that group practices may begin to increase rapidly in number and size. General practitioners tend toward solo practice and are more willing to settle in small communities while internists often prefer group practice arrangements and location in metropolitan areas with larger population bases and proximity to medical education institutions. The impact of the substantial increase in the number of internists whose practice patterns differ significantly from general practitioners must be recognized in planning for primary care physicians in areas which are currently underserved or served by general practitioners. The growth in group practice would provide the opportunity for the effective utilization of nurse practitioners and for physicians' assistants in primary care. Nurse practitioners might practice in rural areas that might not attract a physician if they were supported by and associated with primary care physicians in nearby communities. This pattern already exists for both solo practitioners and group practice, but the latter arrangement perhaps provides a greater potential to rapidly expand the effective use of nurse physician extenders.

In areas which will probably experience a deficit in capacity after implementation of National Health Insurance, it is especially important to have more primary care providers - whether physicians, nurse practitioners or physicians' assistant. National Health Service Corps physicians and nurses will help to meet this need in some areas. More important, however, will be the development of more permanent, local institutions that can meet the needs on a continuing basis. The use of nurse practitioners and physician assistants in association with primary care physicians can be an important mechanism to meet this need.

6. PROJECTIONS OF THE UTILIZATION OF PHYSICIANS SERVICES AND THE CAPACITY OF PHYSICIANS TO PROVIDE SERVICE

We have made some rough estimates of the increases in utilization that might be induced by National Health Insurance and of the capacity of physicians* to meet those demands. It is understandable that policy makers desire relatively precise estimates of physician manpower needs in order to make decisions with regard to the level of public support of medical education. However, the many assumptions required to project health manpower needs, the substantial potential for error in the measurement of relevant variables, and the need to simplify a complex system into a workable model make precise projections impossible.

We believe that a detailed presentation of the methodology we have used to make rough estimates of the increases in utilization that might be induced in California by National Health Insurance and of the capacity of physicians to meet those demands will make clear the potential for error in such projections. The sensitivity of the projections to various assumptions will be indicated in our discussion. Given this critical presentation, we hope that the numbers we ultimately produce can provide a useful perspective for public policy action.

Six categories of assumptions are required in order to estimate the number of physicians needed to meet the utilization patterns expected in the future. They are:

1. The total population and its age distribution.
2. The current utilization of physician services (expressed in terms of office visits), in the aggregate and by specialty.

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* general internists, pediatricians, family and general practitioners

TABLE III-4

ANNUAL RATE OF OFFICE VISITS BY PATIENT AGE, BY REGION UNITED STATES, May 1973-April 1974

Geographic Region	All ages	Age				
		Under 15 years	15-24 years	25-44 years	45-64 years	65 years and older
		Number of Visits per Person per Year				
Region	3.1	2.3	2.6	3.2	3.8	4.9
Northeast------------	3.1	2.4	2.8	3.3	3.6	4.3
North Central--------	3.0	2.2	2.6	3.0	3.6	4.9
South----------------	3.1	2.4	2.6	3.2	3.8	4.8
West-----------------	3.2	1.9	2.6	3.3	4.2	6.2

Source: "Preliminary Data from the National Ambulatory Care Survey," Unedited Draft, (July 15, 1975).

3. The change in demand for physician services that would be brought about by National Health Insurance.

4. The number of physicians in the future and their distribution among specialties.

5. The annual number of patient visits by specialty.

6. The role of nurse practitioners and physicians' assistants in meeting the expanded demand for services.

Based on a series of specific assumptions within these six broad categories we have made projections of the impact of National Health Insurance on the need for physicians. Had we used a different set of assumptions the results might have been far different. It is important to consider our results in the light of the assumption that we made.

We used the D-100 series population projection prepared by the Population Projection Section of the California Department of Finance which assumed a completed fertility rate of 2.5 births. Starting with a total of 21.2 million persons in 1975, they estimate increases to 22.7 million persons in 1980 and 26.1 million persons in 1990. In terms of the impact on the future demand for medical care, the important increases in population are in the age groups 25-44 and those 65 and older.

In order to project the impact of population growth on demand it is necessary to examine the current annual rate of office visits by patient age, according to physician specialty. We used the statistics presented on the utilization of office-based physicians by ambulatory patients from data provided by physicians in the 1973 National Ambulatory Medical Care Survey. (Table III-4). That survey covered the period from May 1973 through April 1974. The data were presented by four age groups and from four geographic regions. Our calculations used the data from the Western Region. Visit rates averaged

TABLE III- 5

PROPORTION OF ANNUAL OFFICE VISITS MADE TO PRIMARY CARE PHYSICIANS, PERCENTAGE UNITED STATES, May 1973 - April 1974

Specialty	Age				
	Under 15	15-24	25-44	45-64	65 and older
General/Family Practice	34.8	46.2	37.5	42.1	42.9
Internal Medicine	0.0	7.7	9.4	15.8	22.4
Pediatrics	39.1	3.8	-	-	-

Source: "Preliminary Data from the National Ambulatory Medical Care Survey," Unedited Draft,(July 15, 1975) p. 34.

TABLE III-6

ESTIMATED "DESIRED" UTILIZATION OF OFFICE-BASED AMBULATORY CARE, UNDER THREE ASSUMPTIONS WITH REGARD TO NATION HEALTH INSURANCE (in millions)

	1975			1980			1990		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
General Practice & Family Practice	28.2	36.6	49.4	30.4	39.5	53.2	34.8	45.2	60.9
Internal Medicine	8.3	10.8	14.5	9.0	11.7	15.8	10.3	13.4	18.0
Pediatrics	4.3	5.6	7.5	4.4	5.7	7.7	5.4	7.0	9.5

(a) No National Health Insurance.
(b) Moderate National Health Insurance, 30% increase in demand.
(c) Extensive National Health Insurance, 75: increase in demand.

Source: Philip Lee and Gerald Weber, "The Impact of National Health Insurance on Health Manpower Policy in California". Health Manpower Study Office, February 1976.

TABLE III-7

PHYSICIAN INCREMENTS REQUIRED BY INDUCED INCREASES IN "DESIRED" USE

	1975			1980			1990		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
General Practice & Family Practice	-	1500	3700	-	1600	4000	-	1800	4600
Internal Medicine	-	700	1600	-	700	1800	-	800	2000
Pediatrics	-	200	500	-	200	500	-	200	600
TOTALS	-	2400	5800	-	-	6300	-	2800	7200

Key and Source are the same as for Table III -6

3.2 per annum for all ages, and ranged from 1.9 visits per year for persons under 15 years of age to 6.2 visits for persons 65 years and over. It should be noted that the visit rates for the youngest group was 21% below the national rate. The proportional distribution of office visits among specialists was computed from national data provided by the 1973 National Ambulatory Care Survey. (Table III-5)Most important are the high utilization rates by those 65 and over and the importance of the general and family practitioners in caring for patients of all ages.

The role of general and family practitioners would be of great importance in the future if present patterns of use continued to 1990, with or without a National Health Insurance program. (Table III-6) What we project as future "desired" utilization for ambulatory care services is an extension of present utilization patterns. By doing this we can see that the data indicates that there would be difficulties in meeting the future "desired" utilization given the current projections among primary care specialists. The need for general and family practitioners, internists and pediatricians will vary with the comprehensiveness of the proposal, the anticipated changes in the population and their use of health services. Had a comprehensive health insurance plan been in effect in 1975, inducing a 75% increase demand for ambulatory care , the State would have required approximately 5,800 primary care physicians to meet the demand. This does not mean that the State would need 5,800 additional primary care physicians because in many areas of the State their present availability and utilization indicates that a substantial capacity exists to meet increased demand. In other areas, however, additional physicians would be needed because physicians appear to be working at full capacity. By 1990 the increase in demand induced by a comprehensive plan would require about 7,200 physicians. (Table III-7)We would apply low probablities to the enactment of such a program, and to a response of that magnitude in California. Nevertheless, such an estimate does provide a portrayal of the adequacy of the projected number of physicians.

To estimate the State's ability to meet future demand we need to examine the projected supplies of primary care physicians. The Bureau of Health Resources Development of the Federal Department of Health, Education, and Welfare has recently made projections of the supply of physicians within broad categories of specialization through 1990. Their basic methodology was to project the future supply of specialists by determining the number of specialists active in December 1970 who would still be active in 1975, 1980 1985, and 1990, and then to estimate the specialty of the new additions to the active supply during the 20 year period. The latter was based on the assumption that the 1972 distribution of first year residents would represent the ultimate specialty choice distribution of new physicians.

Our first adjustment to the data was to reduce the national totals by the ratio of non-federal patient care physicians to all physicians as indicated in the AMA Distribution of Physicians in 1970. We then multiplied by the proportion of patient care physicians in each specialty located in California in 1970. Thus, our underlying assumption was that California would exactly maintain its relative ability to attract physicians from the national supply. Finally, we assumed that 90% of patient care physicians in general practice and family practice were office-based. The evidence indicates that a somewhat smaller proportion, about 80%, of general internists and general pediatricians would be expected to be primarily providing services in a private office. We also assumed that the same proportion of internists and pediatricians would concentrate on a subspecialty as in 1973. The most significant development likely to occur, projecting current trends, are a slight decrease

TABLE III- 8

PROJECTIONS OF OFFICE-BASED PRIMARY CARE PHYSICIANS IN CALIFORNIA 1980 AND 1990

Specialty	(a)	(b)	(c)
General Practice & Family Practice	6100	5800	5300
General Internal Medicine	3500	4900	7300
General Pediatrics	1500	2800	4300

(a) Office-based physicians in California, 1973 (thousands)
(b) Office-based physicians in California, 1980, estimated (thousands)
(c) Office-based physicians in California, 1990, estimated (thousands)

Source: Philip Lee and Gerald Weber, "The Impact of National Health Insurance on Health Manpower Policy in California."

TABLE III- 9

MEAN NUMBER OF OFFICE VISITS PER WEEK & WEEKS WORKED PER YEAR

Specialty	Office Visits Per Week	Weeks Worked Per Year
General Practice & Family Practice	118	48.6
Internal Medicine	82	46.8
Pediatrics	139	47.8

Source: Office visits per week from "Preliminary Data from the National Ambulatory Care Survey," Unedited Draft (July 15, 1975), p. 37.

Weeks worked per year were for Pacific Division in Profile of Medical Practice 1974, prepared by the American Medical Association. page 177.

in general and family practitioners, and a marked increase in the number of internists and pediatricians by 1990. (Table III-8)

The next factor to consider in estimating the State's capacity to meet the increased demand induced by National Health Insurance is the pattern of practice of different specialists Our analysis is limited to office-based ambulatory care. It does not include visits to outpatient facilities of hospitals, other institutional settings such as nursing homes or home visits which make up about 25% of all non-telephone physician visits. We assumed that each office-based physician could provide service equivalent to the mean number of office visits per week attributed to each specialty by the National Ambulatory Medical Care Survey of 1973. (Table III-9) Those data were multiplied by the mean number of weeks worked per year in 1973 in the Western Region computed from the American Medical Association's Periodic Survey of Physicians in order to estimate the annual visits per physician. General and family practitioners and pediatricians see large numbers of patients in the office compared to internists. We have assumed that physicians maintain their level of productivity even in face of increasing demands for their services. There are several reasons for that assumption. First, we have used national data rather than that from the West, or California itself. Other sources indicate that physicians currently handle fewer patient visits in those areas than the national average. For instance, the AMA Periodic Survey for 1973 showed that physicians in the Pacific region provided 16% fewer visits than the national average. In addition, there is evidence from Canada that some physicians actually reduced their productivity when a national insurance program for ambulatory care was introduced.(21) Apparently, the increased fees and reduction in low debts allowed the physicians to attain their desired income while seeing a reduced number of patients.

TABLE III- 10

TOTAL OFFICE-BASED AMBULATORY CARE VISITS POTENTIAL - 1973
ESTIMATED 1980 and 1990
(millions)

Specialty	1973	1980	1990
General Practice & Family Practice	34.9	33.3	30.4
Internal Medicine	13.4	18.8	28.0
Pediatrics	9.7	18.6	28.6
TOTALS	58.3	70.7	87.0

Source:
Philip Lee and Gerald Weber, "The Impact of National Health Insurance on Health Manpower Policy in California." Albany: Health Manpower Study Office, 1976.

Examination of the potential capacity of the anticipated physician supply to respond to the likely increased demand for ambulatory care by 1990 indicates a greatly increased potential for internal medicine, and pediatrics. (Table III-10) In some cases, such as pediatrics, the potential may exceed the demand unless a far higher percentage of the States' children are cared for by pediatricians. At the present about half of the medical services provided children under the age of 15 are provided by general and family practitioners.

It is not possible to assess with any degree of accuracy the likely impact of nurse practitioners and physicians' assistants on the utilization of primary care physicians. In some fields, such as child health care and the care of the chronically ill, nurse practitioners have been found to provide high quality care. Physician productivity, in terms of numbers of patients seen per day, has been increased by as much as 30% to 50% by nurse practitioners and physicians' assistants.

At the present time the barriers to effective utilization of both nurse practitioners and physicians' assistants are physician attitudes, federal and state reimbursement policies, the lack of private insurance coverage or reimbursement licensure and the possible threat of malpractice.

There needs to be a very careful appraisal of the potential of nurse practitioners and physicians' assistants in primary care - which we believe to be substantial - in order that sound manpower, health care and health care financing can be developed.

What conclusions or implications might we draw from this data? We believe that the data warrants the following interpretations:

1. The State starts with an apparent surplus in the aggregate capacity of general and family practitioners, internists and pediatricans to provide ambulatory care office visits relative to current estimated

utilization. The excess capacity to provide office visits appears to be about 42% in 1975. This estimate assumes that primary care physicians in California could provide the same quantity of services per physician as the national average. With no change in financing, we project a potential surplus of 72% by 1990. (Tables III-5 & 9) These estimates do not take into account the unequal distribution of physicians geographically within the State. It appears that some areas are seriously short of primary care physicians, while physicians in some urban areas have work loads that are well below statewide averages and far below the work loads of general practitioners in certain locations. It should be pointed out that these estimates are based on current utilization and do not consider either the quality of care provided or the potential impact on demand of groups that are now underserved.

2. Physicians responsible for providing primary ambulatory care to adults - general and family practitioners, and internists - appear to have less excess capacity than pediatricians. The surplus for general practitioners, family practitioners and internists was about 32% in 1975, decreasing to 29% in 1990. In comparison, the large apparent surplus of pediatricians, 133% in 1975 and 430% in 1990 make it clear that policies encouraging the expansion of primary care physicians should differentiate between specialties. The results of this analysis give us pause and make us doubt the accuracy of the basic data on which these projections are made. Even though we have serious doubts about the data, an excess of pediatricians seems likely because of the large number of children cared for by general and family practitioners and the large increase in the number of pediatricians relative to the increased number of children projected for 1990. The percentage

increase in pediatricians far exceeds the projected increase in children under 14 years of age. (Tables III-3 & 7) The excess in pediatricians might be substantially reduced if pediatricians assumed the responsibility for the care of a high percentage of children, or if the scope of pediatricians changed significantly and pediatricians devoted more of their time to children with developmental defects, emotional problems and learning disabilities.

To further complicate the problem of projections we must consider the future role of pediatric nurse practitioners and family nurse practitioners onthe need for pediatricians. A large increase in the number of pediatric and family nurse practitioners might reduce the need for pediatricians, thus increasing the potential excess by 1990.

3. The capacity of the office-based physicians to provide services to the 1975 population would have been adequate even had a moderate National Health Insurance plan, increasing utilization by 30% for all age groups, been in effect. However, the capacity of physicians specializing in general practice, family practice, and internal medicine would just be adequate to provide services desired. The problems introduced by an unequal geographic distribution of primary care providers could be aggrevated in such a situation. However, that tightness could be partially alleviated by increased use of pediatricians, providing care for children currently utilising general practitioner or family practitioners. At the present time, approximately one-half of all ambulatory visits to office-based practitioners by children under age 15 are to general and family practitioners. By 1990, much of the deficit in the capacity of general and family practitioners and internists induced by comprehensive National Health Insurance might be alleviated by

such a substitution.

4. If a program almost completely eliminating payments on the part of patients was introduced, and led to a 75% increase in the desired utilization of ambulatory care office visits, it would exceed the capabilities of the physicians to meet the demand for their services. In 1975 we estimate such a program would have led to a surplus in desired utilization of 33% for general practitioners, family practitioners and internists in California. There would also be a significant nationwide shortage of these primary care physicians if a comprehensive National Health Insurance program were in effect at the present time.

The data which has been presented must be interpreted with care and caution. Our estimates are very sensitive to each of the assumptions used. Two examples make this clear. An understatement of one-half visit to general practitioners, family practitioners and internists, for example, in the estimate of utilization for the entire State population is equivalent to an understatement of the need for about 2,500 physicians. Also, in order to gain an appreciation of the potential impact of alternative population estimates on the need for physicians, we can look at Series E-0 which assumes a completed fertility rate of 2.1 births. The total population projected in 1990 is 23.6 million or 2.5 million less than that of Series D-100. Since the decline would almost entirely be in the number of persons under age 15, that age group would be but 18% of the population. Under the assumptions we have presented, that decline in the number of children is equivalent to a reduction of 3.5 million office visits to pediatricians, general practitioners, and family practitioners and a decline of about 570 in the number of those physicians required to provide medical care services.

Physician supply projections are dependent on the distribution of residency training positions. The future supply of family practitioners may be well above current projections if the current, short term trends continue. If family practice residencies decline for any reason it would reduce the future number of family practitioners. The projections of the supply of internists and pediatricians are equally dependent on changes in the number of filled residency positions.

In light of these data problems it may be questioned why we have presumed to make the projections we have and to draw any conclusions from them. In our view, the projections are useful because they help to identify potential future problems. They indicate trends and they emphasize the need for more adequate data collection systems.

7. INTERPRETATION AND CONCLUSION

In our judgement, no major new Federal financing program for medical care services is likely to be fully implemented within the next five years. Congressional interest has waned since the Kennedy-Mills proposal came close to passing in 1974. New members of the relevant committees are still developing a basic grasp of the issues and options. The budgetary situation is unfavorable with respect to both general fund financing and the use of the Social Security Payroll tax. President Ford has responded to the potential of continued large budget deficits with a fiscal policy whose expenditure level does not allow for new programs of the magnitude of National Health Insurance. Furthermore, the effect of programs recently introduced by Congress creating Professional Standards Review Organizations and Health Systems Agencies, and supporting Health Maintenance Organizations cannot be evaluated for at least several more years. Since those institutions are supposed to be important forces in the improvement of the operation of the health care delivery system, the Congress may well move slowly on the financing front.

Once National Health Insurance is looked at seriously again, the Congress will require two sessions to complete hearings, prepare legislation, and to enact the final, compromise plan. Two to three years will then be required to develop the administrative machinery to carry out the legislation. There is plenty of time for the State legislature to formulate a well planned health manpower policy in response to NHI. Based on the analyses described in this paper and in our earlier detailed studies of specialty and geographic maldistribution of physicians, we have reached the following conclusions with respect to the potential impact of National Health Insurance.

1. A moderate level expansion of Federal financing, which would primarily impact on the demand for ambulatory care, is not likely to require manpower for most regions of the State beyond that which is likely to be available. Substantial increases in physician manpower are already projected over the next ten years and there is evidence that many physicians in California currently have relatively low numbers of patient visits each week compared to the national average. However, it must be noted that the difficulties which already exist in some areas of the State with respect to the lack of enough primary care physicians are likely to be increased with the passage of even a moderate National Health Insurance Plan. However, the likely expansion of the National Health Service Corps might provide physicians and other health care personnel for a limited number of rural areas.

2. It is evident that NHI will aggravate the already existing need for a relative increase in those physicians who provide primary care to adults. We are not convinced that the apparent tightness in the

capacity of those physicians to provide services relative to the demand should lead to an expansion in the total number of physicians. Rather, we feel that a major shift in the content and focus of graduate training, combined with the increased use of all levels of other health care personnel, likely will be adequate to meet the additional desired utilization. Particularly important, at this time, is the need to expand and strengthen family practice training programs, to provide internists and pediatricians in training with more experience in primary care, and to improve the coordination of nurse practitioner and primary care physician training.

3. In general, it would seem that the impact on demand would be somewhat less in California than in the rest of the United States. This would particularly be true with a plan such as Long-Ribicoff which emphasizes catastrophic coverage with large deductible and an improved Medical Assistance program for low income families. The Health Security Act pays a great deal of attention to the equalization of expenditure among geographical areas over time through allocations of the National Health Budget. Certainly, a large proportion of the increased expenditures induced by the plan would be allocated to those areas with relative shortages in resource supply and with low current levels of expenditures.

As noted above, National Health Insurance would likely reduce the inequality in purchasing power among the various states. Providers would face a considerably different market for their services. There is evidence that, in the past, physicians have located where there is high personal income per capita which could be associated with a greater real demand for medical care services.

California has been one of the beneficiaries of those behavior patterns. Some of its advantage in attracting medical care personnel may be reduced when a comprehensive National Health Insurance plan is implemented.

4. There is tremendous uncertainty in the project of future health manpower requirements. To a great extent this is due to inadequacies in the data. Information on the numbers of physicians, their specialty focus and actual practice, and on the residency training programs is controlled by the medical profession. We believe it is imperative that the Federal government and State governments gather the information they require to adequately understand the present and plan for the future.

At the same time, we must face the fact that the best of data will not provide precise answers to the relevant questions. Measurement is difficult, behavior patterns are hard to measure, and the future does not exactly replicate the present or the past. Therefore mechanisms must be developed to monitor the status of the system on a continuing basis to facilitate a more rational response to shortages or excesses as they become apparent.

5. Finally, we want to emphasize that there are social costs involved with either an oversupply or undersupply of physicians. To the extent that physicians control the use of their services, the potential for the excessive use and dependence on medical care exists. Faced with the uncertainty mentioned before, the state government must balance the potential for error on both sides.

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IV. MEDICINE

1. INTRODUCTION AND SUMMARY

As of October 1975, there were 107 U.S. medical schools approved to award the Medical Degree. There were 54,074 medical students enrolled in the 114 medical schools in the United States in 1974-1975. The first year class numbered 14,963 which is an increase of 5.2% over the previous year. Nationally there has been a 69% increase in the first year medical school enrollment and a 72% increase in the number of M.D. degrees awarded in the United States in the past ten years.

In California we have presently 8 of the 107 degree granting medical schools, (5 public and 3 private). In addition, there is the Charles R. Drew Postgraduate Medical School offering only residency training and continuing education programs for physicians.

In 1972, the Berkeley campus initiated a new program in medical education to be operated jointly with the School of Medicine at San Francisco with a strong emphasis on primary care and utilization of community resources. In 1974, the Riverside campus of the University of California in conjunction with the University of California in Los Angeles developed a new biomedical science program which will begin to enroll 24 students by 1977 at the medical school campus in Los Angeles.

Planning has also been initiated between the U.C.S.F. Medical School and the Fresno Veterans Administration Hospital for a new medical education component in the northern San Joaquin Valley with a planned enrollment of 6 third-year students and 94 interns and residents in 1976.

Total California M.D. degrees awarded went from 463 in 1965 - 1966 to 889 in 1974 - 1975 which is an increase of 92% contrasted with a 72%

increase nationally. In the same period, the California population growth only averaged less then 2% per year. Despite this rapid growth, California in 1975 only contributed 5.9% of the total M.D. graduates in the nation.

Only 28.5% of the 1975 active non-federal physicians in California received their medical education in the State. 60.6% of the California physicians graduated from medical schools in other states and approximately 10.9% of California physicians were trained in foreign medical schools; 56.5% of all California graduates attended private medical schools in the State. 67.2% of California 1975 graduates chose to remain in California; 54.2% of the graduates are currently interning in the State.

California may not be able to continue to depend on in-migration from other states, however. Many states have become conscious of their loss of highly trained manpower to our State and are seeking ways through incentive programs, mandatory service legislation and other strategies to retain graduates within their own medical underserved areas. A review of the factors which may change migration patterns of physicians are examined in a later chapter.

The maldistribution of physicians is significant in urban counties. San Francisco County with 3.2% of the State population has 8% of the total physician population. Los Angeles has 32.7% of the State population with 35% of the physicians, while some of the rural counties have a much lower ratio of physicians per 100,000 civilian population.

Although the state of California has a higher ratio of physicians than many other states, approximately 22% of the population of California is estimated to be in need of primary care services. The Health Manpower Policy Commission identified in 1975 seven census tracts in the downtown area of

San Francisco County, seventy-five census tracts in Los Angeles County, sixteen census tracts in the city of San Diego, fourteen census tracts in the city of Oakland, and fifteen other rural counties as critical physician shortage areas.

To deal with the current physician manpower problems in California which include a relative shortage of primary care physicians, a relative shortage of physicians in some rural and low income urban areas, and an oversupply of physicians performing surgery will require changes in federal health manpower policy, policies of the Coordinating Council on Medical Education, the Liaison Committee on Graduate Medical Education, and the various specialty boards and societies involved in residency training as well as health manpower policies in California. In terms of manpower policies, the number and distribution of residency training positions is the key to future supply. It is the policy area which we address in the greatest detail in this report. Reimbursement policy under private health insurance, Medicare and Medicaid are also important.

The problems of geographic and specialty maldistribution are interrelated for several reasons including the different practice location preferences of internists and other specialists as compared with general and family practitioners, the significant variance in the number of patients seen per day and per week by general practitioners and other primary care specialists, the declining number of general practitioners and the increased number of internists and pediatricians who will be providing primary care in the future. In this report we examine the following issues both from the national perspective and in relation to California.

1. What is the problem?
2. The optimal distribution among specialists

3. Primary care and primary care specialties

4. Physician specialization in California

5. Specialization and physician location

6. Specialization, demand, and utilization

7. Residency training programs in California

8. The control of residency training

9. Choosing sites for training

Based on the analysis of this report, we have reached the following conclusions:

1. Policies of the federal government and migration patterns of physicians will have a greater impact on the total number of physicians in California and their distribution by specialty than state policies. The great majority of California practicing physicians received their undergraduate medical education outside of California. More than one-third of American medical school graduates in the last decade who are practicing in California had none of their graduate training in California.

Federal legislation under consideration could have considerable impact on the state of California. However, it must be kept in mind that the law which is finally enacted would not become effective until 1977 at the earliest. The length of time required to implement its mandates will vary according to the specific provisions, thus possibly delaying the full impact until the 1980's. The impact of those provisions which focus on medical students newly enrolled after enactment of the legislation will be even further delayed by the length of the physician training process.

2. Our projection of the California specialty distribution for 1990, based on DHEW national projections, indicates that the growth in primary care physicians, while substantial, will remain considerably less than the growth in the surgical specialties and other medical specialties. There is

no one method available for determining the optimal distribution of physicians among specialties. However, we are willing to accept as a tentative objective the widely suggested criteria that 50% of all physicians should be in primary care specialties. As previously noted, the primary responsibility for changing this projected trend must fall to the federal government. However, the State can have important marginal impact through the direct subsidy of certain programs such as family practice and other primary care residencies. It seems to us that the trends in specialty training during the past four years and the failure of present voluntary mechanisms to effectively control the total number of residencies or create a balanced mix among training positions in primary care and other specialties is hardly a cause for optimism that the voluntary approach will succeed in the future.

3. The choice of sites for primary care training programs is a complex decision. Consideration must be given to the level of clinical training under consideration. Residents require a sophisticated education experience with a relatively large patient base and a wide disease spectrum. A list of detailed criteria is given in another section of this report.

TABLE IV-1

LICENSED PHYSICIANS IN CALIFORNIA BY COUNTY

12/30/75

Type - Physicians and Surgeons

Alameda	2,551
Alpine	
Amador	21
Butte	184
Calaveras	17
Colusa	12
Contra Costa	1,122
Del Norte	8
El Dorado	79
Fresno	682
Glenn	10
Humboldt	165
Imperial	10
Inyo	165
Kern	65
Kings	26
Lake	399
Lassen	53
Los Angeles	24
Madera	22
Marin	16,118
Mariposa	34
Mendocino	1,126
Merced	11
Modoc	108
Mono	117
Monterey	5
Napa	7
Nevada	473
Orange	266
Placer	138
Plumas	15
Riverside	822
Sacramento	1,408
San Benito	13
San Bernardino	1,186
San Diego	3,716
San Francisco	3,700
San Joaquin	437
San Luis Obispo	212
San Mateo	1,363
Santa Barbara	639
Santa Clara	2,738
Santa Cruz	273
Shasta	142
Sierra	4
Siskiyou	38
Solano	284
Sonoma	457
Stanislaus	318
Sutter	49
Tehama	24
Trinity	7
Tulare	225
Tuolumne	33
Ventura	669
Yolo	289
Yuba	58
Out of State	28,349
Out of Country	1,416
Prefix Count	75,930

SOURCE: Board of Medical Examiners.

2. SUPPLY TRENDS AND PROJECTIONS

Licensure Data: The California Board of Medical Examiners reported that as of December 30, 1975 there were 75,930 physicians and surgeons licensed in the State.(1) Of that total, 28,349 had established legal residence out of state and 1,416 out of country, leaving a total of 46,165. There are no 1975-76 data available regarding the percent of the licensed resident physician population which are active and inactive. The Board listing, however, does show some interesting distribution figures by county. (See Table IV-1.)

Los Angeles County has a current licensed physician population of 16,118 which represents 35% of the physician population and corresponds to 32.7% of the state population. San Diego with a population of 3,716 and San Francisco with a population of 3,700 represent 8% each of the total physician population and 7.4% and 3.2% respectively of the state population. Orange County with a population of 3,147 has 6.8% of the physician population while Alpine County (population of about 650) has no licensed physicians; Sierra 4; Modoc 5; and Mono County 7.(6)

TABLE IV-2

ACTIVE NON-FEDERAL PHYSICIANS, CIVILIAN POPULATION, AND PHYSICIAN/POPULATION RATIOS IN CALIFORNIA BY PSRO AREA AND COUNTY, DECEMBER 31, 1973

PSRO Area & County	Physicians	Population	Ratio
1. Del Norte	8	15,700	51.0
Humboldt	128	102,800	124.5
Lake	17	22,950	74.1
Mendocino	77	54,200	142.1
Sonoma	342	235,100	145.5
Total	572	430,750	132.8
Butte	160	114,300	140.0
Colusa	12	12,450	96.4
Glenn	10	18,350	54.5
Lassen	21	17,750	118.3
Modoc	2	8,475	23.6
Plumas	13	13,500	96.3
Shasta	124	86,000	144.2
Sierra	2	2,720	73.5
Siskiyou	28	35,300	79.5
Sutter	45	44,900	100.2
Tehama	22	31,650	69.5
Trinity	5	8,925	56.0
Yuba	49	44,750	109.5
Total	493	438,970	112.3
3. Marin	667	215,500	309.5
Napa	220	87,100	252.6
Solano	171	181,900	94.0
Total	1,058	484,500	218.4
4. El Dorado	55	53,500	102.8
Nevada	35	31,000	112.9
Placer	109	89,400	121.1
Sacramento	1.191	682,100	174.6
Yolo	244	103,600	235.5
Total	1,634	959,600	170.3
5. San Francisco	3,587	675,600	530.9
6. San Mateo	1,006	571,100	176.2
7. Alameda	2,103	1,097,400	191.6
Contra Costa	847	590,100	143.5
Total	2,950	1,687,500	174.8
8. Alpine	0	650	-
Amador	14	14,350	97.6
Calaveras	17	15,350	110.7
San Joaquin	381	300,100	127.0
Tuolumne	21	26,100	107.3
Total	440	356,500	123.4
9. Santa Clara	2,504	1,167,000	214.6
10. Mariposa	8	7,175	111.5
Merced	78	117,500	66.4
Stanislaus	278	210,400	132.1
Total	364	335,075	108.6
11. Fresno	579	438,700	132.0
Madera	25	44,900	55.7
Total	604	483,600	124.9
12. Monterey	329	258,600	127.2
San Benito	8	19,500	41.0
Santa Cruz	208	143,500	144.9
Total	545	421,600	129.3
13. Kings	40	68,500	58.4
Tulare	193	201,900	95.6
Total	233	270,400	86.2
14. Kern	359	340,900	105.3
15. Inyo	21	17,150	122.4
Mono	4	7,025	56.9
San Bernardino	1,038	699,700	148.3
Total	1,063	723,875	146.8
16. San Luis Obispo	170	121,500	139.9
Santa Barbara	509	275,600	184.7
Total	679	397,100	171.0
17. Ventura	538	426,100	126.3
18 - 25. Los Angeles	14,346	6,941,000	206.7
26. Orange	2,455	1,646,300	149.1
27. Riverside	609	507,800	119.9
28. Imperial	51	80,600	63.3
San Diego	2,659	1,502,600	177.0
Total	2,710	1,583,200	171.2
California Total	38,749	20,848,520	185.9

Source: California Medical Association, "Physician Supply in California, December 1973", Socioeconomic Report, January 1975, page 2.

Distribution: More detailed analyses of the physician population available in California, however, were conducted December 31, 1973 by the Bureau of Research and Planning, California Medical Association.(1) At that time the active non-Federal physician population in California was reported to be 38,749 or a ratio of 185.9 physicians per 100,000 persons. (See Table IV - 2)

Markedly different estimates of the ratio of active patient care physicians/100,000 population were reported for California in 1973 (2) by the AMA. They reported a ratio of 168 for California as compared with 131 for the entire U.S. Whether the CMA or AMA estimated ratios are utilized, it is apparent that California is well ahead of the rest of the country. According to the AMA (2) between 1961 and 1972, the U.S. ratio of active patient-care physicians/100,000 increased from 122 to 129. In California, the ratio increased from 157 to 166 during the same period of time. (3)

TABLE IV-3

U.S. SUPPLY OF ACTIVE PHYSICIANS (M.D. & D.O.) AND PHYSICIAN/POPULATION RATIOS

Actual 1970; Projected 1975-1990

	1970		1975		1980		1985		1990	
	number	rate*	number	rate*	number	rate*	number	rate*	number	rate*
Basic methodology[1]	323,200	158.6	377,500	175.7	446,800	196.9	519,000	216.9	593,800	236.9
Low alternative[2]	323,200	158.6	371,900	173.1	433,600	191.1	494,100	206.5	552,000	220.2
High alternative[3]	323,200	158.6	383,100	178.3	459,900	202.7	544,300	227.4	637,100	254.2

* rate per 100,000 population; based on U.S. Census Report and Projections, resident population:

1970 - 203,805,000
1975 - 214,883,000
1980 - 226,934,000
1985 - 239,329,000
1990 - 250,630,000

Three methodologies were used to account for the impact of future funding on first year medical school enrollment and possible variations in the number of Foreign Medical Graduates (FMG's):

1 - assumes a moderate increase in enrollment and a moderate increase in the number of FMG's
2 - assumes a stable enrollment remaining at the 1974-75 level and a small increase in the number of FMG's
3 - assumes a higher increase in enrollment, twice that of the basic methodology and a large increase in the number of FMG's

Notes: Figures include all active physicians in the 50 States and the District of Columbia, also Puerto Rico & other outlying areas of the U.S., and all Federal physicians abroad. (U.S. and foreign graduates)

Projections include all physicians active on 12/31/70 plus the estimated number of graduates for the twenty-year period minus the estimated number of physicians lost due to retirement and death.

Source: The Supply of Health Manpower, 1970 Profiles and Projections to 1990, U.S. Department of Health, Education and Welfare, December 1974, chapter 3.

The Bureau of Health Resources(4) recently projected that the overall MD/population ratio is going to increase from 159/100,000 in 1970 to 237 per 100,000 in 1990. (See Table IV-3). Specialty-wise the general practice M.D. ratio to population is expected to decline from 28/100,000 in 1970 to 15 per 100,000 in 1990. The surgical specialties are expected to increase their M.D. per population ratio significantly, as are internal medicine, pediatrics and family practice.

Lipson(3) recently projected that total non-Federal M.D. supply in California will increase at an annual rate of 3.5% between 1970 and 1980 and 3% between 1980 and 1990; presumably helping the State to retain its

TABLE IV-4

PHYSICIANS IN PRIMARY CARE AND PATIENT CARE, AND PHYSICIAN-POPULATION RATIOS, CALIFORNIA, 1971 AND 1973

	Active Patient Care Physicians				Percent Change	
	Number		Ratio		1971 to 1973	
Characteristic	1971	1973	1971	1973	number	ratio
General Practice	6751	6510	33.1	31.2	(3.6)	(5.7)
Internal Medicine	4478	4874	22.0	23.4	8.8	6.4
Pediatrics	1943	1998	9.5	9.6	2.8	1.1
Obstetrics/Gynecology	2122	2211	10.4	10.5	4.2	1.9
Total Primary Care MDs	1529[illegible]	15593	75.0	74.8	2.0	(0.3)
Other Pacient Care MDs	17716	18466	86.9	88.6	4.2	2.0
Total Patient Care MDs[1]	33010	34059	161.9	163.4	3.2	1.0

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[1] Excludes physicians whose specialties are unknown.

SOURCE: California Medical Association, "Physician Supply In California, December 1973, Sacramento: Socioeconomic Report, January 1975, p. 5.

favorable M.D./population which in 1971 ranked fourth nationally.(5) These projections are based, however, upon a continuation of a favorable inmigration of M.D.'s to California, an issue which will be dealt with later in the report. The consideration of gross ratios however ignores the mix of primary care versus specialty practice physicians in a given population.

Table IV-4 outlines the mix of physicians in primary care (general practice, internal medicine, pediatrics, and obstetrics-gynecology) and other specialty practices in 1971 and 1973 in California. Those physicians in general (or family) practice showed a decline of 5.7% in the two-year period. This resulted in an overall decrease in total primary care M.D.'s of 3% during the same period of time, a trend which has been evidenced during the past few decades.(1) Further consideration shall be given to the issue of physician specialty mix and related medical education issues throughout the remainder of the report.

TABLE IV-5

1975 ACTIVE, NON-FEDERAL PHYSICIANS IN CALIFORNIA BY STATE OF GRADUATION

State of Graduation	Number of Physicians	State of Graduation	Number of Physicians	State of Graduation	Number of Physicians	State of Graduation	Number of Physicians
Alabama	57	Tennessee	639	Dom. Republic	7	Manchuria	2
Arizona	53	Texas	622	Equador	12	Mexico	218
California	11056	Utah	261	Egypt	57	Netherlands	59
Colorado	402	Vermont	103	El Salvador	8	New Zealand	11
Connecticut	313	Virgina	213	England	116	Nicaragua	9
Dist. of Col.	1047	Washington	284	Estonia	3	Nigeria	1
Florida	185	W. Virginia	32	Finland	6	Norway	6
Georgia	126	Wisconsin	818	Formosa-Taiwan	31	Pakistan	22
Hawaii	16	Alberta	68	France	27	Panama	2
Illinois	3341	Brit. Columbia	68	Germany	280	Paraguay	3
Indiana	488	Manitoba	231	Germany West	9	Peru	28
Iowa	482	Newfoundland	1	Greece	36	Philippines	420
Kansas	366	Nova Scotia	33	Guatemala	3	Poland	16
Kentucky	286	Ontario	301	Haiti	3	Portugal	10
Louisiana	528	Quebec	352	Honduras	6	Romania	17
Maryland	538	Saskatchewan	10	Hong Kong	26	Scotland	40
Massachuesetts	1153	Afghanistan	2	Hungary	42	Singapore	4
Michigan	1060	Argentina	100	Iceland	3	S. Africa	40
Minnesota	675	Australia	39	India-Goa	194	S. Vietman	1
Mississippi	22	Austria	80	India	1	Spain	30
Missouri	1151	Belgium	34	Indonesia	5	Sweden	5
Nebraska	1033	Bolivia	10	Iran	58	Switzerland	151
New Hampshire	8	Brazil	16	Iraq	15	Syria	7
New Jersey	76	Bulgaria	4	Ireland	106	Thailand	15
New Mexico	49	Burma	9	Israel	26	Turkey	10
New York	3095	Ceylon	12	Italy	144	Uganda	1
N. Carolina	267	Chile	26	Jamaica	3	USSR	5
Ohio	1054	China	65	Japan	56	United Arab Rep.	18
Oklahoma	200	Taiwan-Formosa	9	Korea	70	U.K.-Eng., Wales	30
Oregon	453	Columbia	21	Latavia	6	U.K.-Scotland	6
Pennsylvania	1848	Costa Rica	1	Lebanon	51	Uruguay	9
Puerto Rico	18	Cuba	38	Lithuania	5	Venezuela	11
Rhode Island	4	Czechoslovakia	49	Malasia	1	Wales	1
S. Carolina	50	Denmark	10	Malia	1	West Indies	1
						Yugoslavia	32

SOURCE: Data received from Medical Mailing Service; Chicago, Ill.

Migration: Only 28.5% of 1975 active non-Federal physicians in California received their medical education in the State. Sixty and six-tenths percent of California physicians graduated from medical schools in other states and approximately 10.9% of the physicians trained in foreign medical schools. (See Table IV-5).

56.5% of all California graduates attended private medical schools in the State.

Five hundred and three of 749 graduates of 67.2% of California 1975 graduates remained in the State.

54.2% of these graduates are currently interning in the State.

California may not be able to continue to depend on in-migration from other states, however. Many states have become conscious of their loss of highly trained manpower to our state and are seeking ways through incentive programs, mandatory service legislation and other strategies to retain graduates within their own medically underserved areas. The high in-migration this past has in fact resulted in making "physician rich" areas richer. Although it has improved the availability of physicians in all areas in the State somewhat, it has not alleviated the manpower shortage problems of many California underserved areas.

Review of Factors Which May Change Migration Patterns of Physicians to California

There are a number of factors that may change the pattern of physician location from that of the past. The level of economic activity and growth of population in California appear to be declining relative to the rest of the nation. Medical school positions also appear to be expanding rapidly in parts of the country which have provided a relatively small proportion of physician migrants to California. Furthermore, state-supported schools are reducing the number of out-of-state students accepted into their programs. Federal programs supporting the purchase of medical care are likely to improve the relative capability of the poorer states to attract physicians and federal health manpower policy will focus to some extent on reducing inequalities in the geographical distribution of personnel. Finally, factors such as the relative level of malpractice insurance premiums may impact on the locational choice of some physicians.

There have been many studies of the factors impacting upon choice of practice location by physicians. The following discussion will outline some of these variables.

One's community of origin, medical education expenses and medical education facilities all interact in determining migration patterns. Studies show that most medical students attend medical school in the state in which they reside prior to admission to school. The number of positions for medical students in turn is affected by the availability of medical facilities. Opinion is divided as to how significant an attraction medical education facilities are for encouraging physicians to locate in a given vicinity.(36) There is evidence, though, that the availability of graduate training may be an important factor in attracting physicians first starting out to practice.

TABLE IV-6

RELATIVE POPULATION GROWTH IN REGIONS OF THE UNITED STATES, 1950 THROUGH 1974 (AVERAGE ANNUAL PERCENT CHANGE)

Division or State	1950-1960	1960-1970	1970-1974
New England	1.2	1.2	0.6
Middle Atlantic	1.2	0.8	0.0
East North Central	1.8	1.1	0.4
West North Central	0.9	0.6	0.5
South Atlantic	2.0	1.7	1.9
East South Central	0.5	0.6	1.1
West South Central	1.5	1.3	1.5
Mountain	3.0	1.9	3.0
Pacific	3.4	2.2	0.9
TOTAL U.S.	1.7	1.3	0.9

SOURCE: U.S. Bureau of the Census, Statistical Abstract of the United States (Washington, D. C. 1975), p. 12. Taken from background paper on factors influencing migration by Gerald I. Weber, Ph.D.

The presence of graduate training facilities is an area where California shows considerable strength. Recent growth in residencies offered in California has surpassed that for the nation as a whole. However, California's ability to keep such a favored position may be affected by future federal government policies as well as by a changing, general trend towards increasing enrollment of state residents. (37)

Population size also has appeared to be by far the single most powerful determinant of variation in physician aggregation and some studies have shown population change in an area is the most powerful determinant of the change in the supply of physicians in an area.(38)

Recent patterns of population growth in the country, however, indicate the role of California as the most favored destination has all but disappeared. It is difficult to predict the exact impact of the relative decline in the movement of population to California on the locational patterns of physicians; however, it may well be the State will have some difficulty as the young physicians try to find the markets with the greatest growth. (See Table IV-6.) In addition to the direct impact of population growth, other regions appear to have a much greater potential for increasing urbanization.

Per capita income is another factor impacting on the choice of a practice location by physicians. It is a major determinant of the financial capacity of the population to purchase medical care services and it serves as a barometer to measure "the amenities which develop to satisfy the tastes of higher income, well-educated persons."

While the per capita income of Californians in the past was greater than that for the entire U.S., the last few years has shown a decrease in income levels per capita and if the trends continue, they may provide another force in reducing the relative attractiveness of the state to physicians. (See Table IV-7)

TABLE IV-7

PER CAPITA PERSONAL INCOME, UNITED STATES, CENSUS DIVISION, AND CALIFORNIA, 1950, 1960, 1974

Division or State	1950	1960	1974
New England	$1,601	$2,430	$5,697
Middle Atlantic	1,751	2,582	6,033
East North Central	1,666	2,391	5,773
West North Central	1,428	2,061	5,206
South Atlantic	1,211	1,843	5,073
East South Central	915	1,497	4,279
West South Central	1,207	1,819	4,622
Mountain	1,418	2,087	4,965
Pacific	1,798	2,612	5,903
California	1,852	2,709	5,997
TOTAL U.S.	1,496	2,222	5,434

SOURCE: U.S. Department of Commerce, Survey of Current Business, (April 1969); U.S. Bureau of the Census, Statistical Abstract of the United States, (Washington, D. C. 1975), p. 388. Taken from background paper on factors influencing migration by Gerald I. Weber, Ph.D.

TABLE IV-8

PHYSICIAN INCOME AND VISITS PER PHYSICIAN
BY CENSUS DIVISION, 1973

Division	Physician Net Income	Visits Per Week Per Physician
New England	$45,890	114.4
Middle Atlantic	45,649	113.4
East North Central	51,830	152.9
West North Central	48,225	160.6
South Atlantic	50,408	148.8
East South Central	57,466	182.9
West South Central	50,301	151.1
Mountain	44,510	137.8
Pacific	50,882	119.2
TOTAL U.S.	49,415	137.7

SOURCE: Judith Warner and Phil Aherne, Profile of Medical Practice '74, American Medical Association, (Chicago, 1974), pp. 171 and 193. Taken from background paper on factors influencing migration by Gerald I. Weber, Ph.D, Physician income, other things equal, is another variable that influences physician location, i.e. physicians will likely choose to practice where their opportunity to earn monetary income is greatest.

In California where there is currently a relatively large supply of physicians, physicians have kept up their income through their ability to charge high fees. There is evidence though, that additional physicians would have a particularly difficult time attracting patients in some parts of California where there already are exceptionally high physician population ration and a very low number of visits per physician. The passage of a major national health insurance plan would enhance the financial attractiveness of other regions relative to California. However, there is not likely to be much impact in California. (See Table IV-8).

Licensing requirements may have a future effect on migration patterns. The concept of national licensure was suggested with the hope of facilitating interstate movement. There are also implications here in the area of developing stricter screening procedures for foreign medical graduates.

Cultural, social, and environmental conditions are difficult to project. Currently, major consideration must be given to the impact of the unfavorable level of malpractice premiums on the attraction of physicians to California, even though it is too soon to accurately measure the effect of the recent rapid increases in premiums in the State.

Outlined in the previous pages have been some recent changes in those factors impacting on the choice of practice location by physician. It appears it will be difficult for California to continue to attract physicians trained in other states to the extent it has during the past few decades. Economic growth in the state has slowed down considerably relative to the rest of the country. Associated with that decline, the rate of population growth has been reduced. It also is becoming more difficult for Californians to go to medical school out-of-state because of an increasing preference towards residents of the state in which medical schools are located.

Perhaps the most important factor changing in California's past patterns of success will be the underlying economic process influencing physician location, associated with the large increases in the size of future medical school graduating classes. There is already evidence physicians in some urban areas in California are working far below their capacity as measured by office visits per week. While the underlying process which determines physicians income and their perceptions of the potential for practice is barely understood, I doubt the capacity of medical care service areas, already well endowed with medical manpower, to absorb proportionate numbers of future graduates.

Enrollment and Degree Data: As of October 1975 there were 107 U.S. schools approved to award the M.D. degree.(9) There are an additional five U.S. schools with provisional approval which have students enrolled and who will be surveyed for full approval the first year they award the M.D. degree. Two other U.S. schools are fully accredited to offer the first two years of basic science medical curriculum. In addition there are eleven other proposed medical schools in various stages of planning development, with no students enrolled.

There were 54,074 medical students enrolled in the 114 medical schools in the U.S. in 1974-1975.(9) This represents an increase of 3,188 students over the 1973-73 year. The frist year class numbered 14,963, which is an increase of 788 students (5.2%) over the previous year. Nationally there has been a 69% increase in the first year medical school enrollment in the past ten years. One hundred and seven schools granted the M.D. degree to 12,714 students in the academic year 1975, an increase of 9.5% or 1,101 graduates over the 1973-74 year.

Table IV-9 provides a numerical history of student enrollment and M.D. degrees awarded in U.S. schools between 1930 and 1975. During the last ten years, M.D. degrees awarded in the U.S. increased 72% (or 7.2% increase per year).

TABLE IV- 9

STUDENTS AND GRADUATES IN MEDICAL AND BASIC SCIENCE SCHOOLS
1930-1975

Year	No. Schools*	Total Enrollment	First Year	Intermediate Years	Graduates
1930-1931	76	21,982	6,456	10,791	4,735
1935-1936	77	22,564	6,605	10,776	5,183
1940-1941	77	21,379	5,837	10,267	5,275
1945-1946	77	23,216	6,060	11,330	5,826
1950-1951	79	26,186	7,177	12,874	6,135
1955-1956	82	28,639	7,686	14,108	6,845
1956-1957	85	29,130	8,014	14,320	6,796
1957-1958	85	29,473	8,030	14,582	6,861
1958-1959	85	29,614	8,128	14,626	6,860
1959-1960	85	30,084	8,173	14,830	7,081
1960-1961	86	30,288	8,298	14,996	6,994
1961-1962	87	31,078	8,483	15,427	7,168
1962-1963	87	31,491	8,642	15,585	7,264
1963-1964	87	32,001	8,772	15,893	7,336
1964-1965	88	32,428	8,856	16,163	7,409
1965-1966	88	32,835	8,759	16,502	7,574
1966-1967	89	33,423	8,964	16,716	7,743
1967-1968	94	34,538	9,479	17,086	7,973
1968-1969	99	35,833	9,863	17,911	8,059
1969-1970	101	37,669	10,422	18,901	8,367
1970-1971	103	40,487	11,348	20,165	8,974
1971-1972	108	43,650	12,361	21,738	9,551
1972-1973	112	47,546	13,726	23,429	10,391
1973-1974	114	50,886	14,185	25,088	11,613
1974-1975	114	54,074	14,963	26,397	12,714

*Prior to 1956-57, schools in development were not included.

SOURCE: AMA, Department of Undergraduate Medical Education and the AAMC Division of Operational Studies, "Undergraduate Medical Education," *JAMA*, 234: 1338, December 28, 1975.

California presently has eight undergraduate medical schools (five public and three private) approved to grant the M.D. degree:

University of California--San Francisco--UCSF
Los Angeles --UCLA
Davis --UCD
Irvine --UCI
San Diego --UCSD

University of Southern California --USC
Stanford University
Loma Linda University

Additionally there is the Charles R. Drew Postgraduate Medical School, which is affiliated with Martin Luther King Jr. Hospital in the Watts-Willowbrook area of Los Angeles. The Drew School offers only post-M.D. residency training along with continuing education programs for physicians.

An innovative Biomedical Sciences Program emphasizing the training of physicians for primary care was developed in joint effort with UC--Riverside and U.C.L.A. In Fall 1974, Riverside accepted freshmen into the program. By the end of the third undergraduate year, 24 students will be selected for continuation into the professional M.D. program. In the fourth and fifth years (1977-78 and 1978-79), while still in residence at Riverside, there 24 students will be co-registered in the medical school at Los Angeles. In the sixth and seventh years, participants will complete the requirements for the M.D. degree at the medical school at Los Angeles.

In 1972, the Berkeley campus initiated a new program in medical education, to be operated jointly with the School of Medicine at San Francisco for the purpose of determining whether a strong direction toward primary care could be maintained by emphasizing the use of existing campus basic and behavioral science courses and community resources.

TABLE IV- 10

TABLE M.D. DEGREES CONFERRED BY CALIFORNIA MEDICAL SCHOOLS 1965-1975 AND PROJECTED FOR 1976 AND 1977

SCHOOL											PROJECT	
	65 66	66 67	67 68	68 69	69 70	70 71	71 72	72 73	73 74	74 75	75 76	76 77
UCSF	99	101	128	130	126	131	122	133	136	137	149	149
UCLA	70	68	76	71	78	113	130	136	132	144	158	157
UCD							46	49	50	95	100	108
UCI	88	87	89	75	58	64	64	67	63	64	71	85
UCSD							45	50	52	48	63	69
USC	63	71	67	69	73	74	84	85	103	97	115	132
STANFORD	54	48	61	61	69	69	75	88	74	81	73	80
LOMA LINDA	89	88	83	69	85	95	97	*220	133	83	**160	**160
TOTAL	463	463	504	475	499	546	663	828	743	749	889	940

Compiled from data submitted to the California Study Office by Individual Medical Schools, Fall and Spring 1976.

NOTE: University of California--Riverside is not projected for medical student enrollment until 1977-78.

*Transition year to 3-year curriculum with two graduating classes in one year.

**Includes two graduating classes per year (June and December) of approximately 80 students each.

Planning has also been initiated between UCSF Medical School, the Fresno Veterans Administration Hospital and other interested parties for a new medical education component in the Northern San Joaquin Valley, with planned enrollment of 6 third-year medical students and 94 interns and residents in 1976-77.

The pattern of M.D. degrees conferred by California medical schools from the 1965-66 year through the current academic year may be seen in Table IV-10. Total California M.D. degrees awarded went from 463 in 1965-66 to 889 (projected for the present year), an increase of 92% (as contrasted with a 72% increase nationally). This approximate increase of California M.D. graduates of 9% per year compares with a national average increase of about 7% per year. During most of the time period during which this M.D. productivity occurred the California population growth averaged less than 2% per year.(3)

Between 1950 and 1959 California produced 5% of the nation's M.D. graduates. From 1960-62 this increased to 5.5%, from 1968 through 1972 it increased to 6.2% of the nation's total.(3) The State's percentage contribution of the nation's M.D. graduates then varied as follows 1973--7.9%, 1974--6.4%, and 1975--5.9% (see Table IV-9 and AMA Report on Undergraduate Medical Education.(9)

The United States medical school graduates will probably increase to about 14,680 in 1980 (approximately a 6-9% annual increase). California medical school graduates are projected to increase to 962 in 1980 (an approximate 6.4% annual growth). Thus, through 1980 it appears that the California and national M.D. growth increase will be proportional.(3)

__Projected Supply and In-Migration of Physicians.__ A detailed description of physicians in California is described in Appendix D, together with a base case projection in which observed past patterns and trends are assumed to continue into future years. In this projection methodology, estimates are made of expected losses or attrition in the existing (1975) supply of physicians as are expected gains or additions from new California graduates and new in-migrations. A summary of the base case projection is shown in Table IV-11.

TABLE IV-11. BASE CASE PROJECTIONS OF CALIFORNIA PHYSICIANS(40)

	1975	1980	1985	1990
Total Licensed (Non-Federal)	46,165	54,732	64,447	74,772
Total Active	42,646	50,502	59,356	68,691
Residents and Interns	6,829	8,581	9,727	10,682
California Graduates	2,050	2,500	2,832	3,129
Other U.S. Graduates	4,141	5,252	5,950	6,499
Foreign Medical Graduates	637	818	944	1,054
Other Physicians	35,816	41,921	49,628	58,009
California Graduates	10,104	11,810	13,948	16,213
Other U.S. Graduates	21,693	25,366	29,940	34,873
Foreign Medical Graduates	4,018	4,744	5,739	6,922
California Population (thousands)	21,206	22,659	24,363	26,098
Active Physicians per 100,000	201	222	243	251

A. Educational Output.

In this base case projection, it was assumed that the future rate of growth in California physician education programs would be equal to the rate of growth for the United States, as estimated in reference 4. The annual rate of growth is as follows: .0240 for the 1976-80 period, .0133 for the 1981-85 period, and .0133 for the 1986-90 period. These rates of growth were chosen to provide a basis of comparison with the results for the United States as shown in Table IV-12.

TABLE IV-12

COMPARISON OF UNITED STATES AND CALIFORNIA PAST AND BASE CASE(40)
PROJECTED FUTURE SUPPLY OF ACTIVE PHYSICIANS

	United States*		California	
Year	Active Physicians	Ratio, Physicians per 100,000**	Active Physicians	Ratio, Physicians per 100,000
1960	251,900	140	--	--
1965	288,700	145	--	--
1970	323,200	159	--	--
1975	377,500	176	42,646	201
1980	446,800	197	50,502	222
1985	519,100	217	59,356	243
1990	593,800	237	68,691	263

*Source: The Supply of Health Manpower, 1970 Profiles and Projections to 1980, Department of Health, Educaton, and Welfare.

**Includes osteopaths.

These results show that the basic methodology and base case projection described in Appendix D are consistent with the methodology and assumptions used in the national projection. The trend in the number of physicians in California per 100,000 matches that projected for the U.S. very closely.

The actual rates of growth in future educational output of trained physicians in the state of California is, in fact, likely to depart from the national average and will be determined in part by state policy. However, as stated above, the methodology employed for projecting future supply can be used to examine the impacts of alternative assumptions. A complete description of the sensitivity analyses performed on the impacts of various assumptions is contained in Appendix D. A summary of the impacts of changes in educational output considered in this appendix is shown in Table IV- 13.

TABLE IV-13

SENSITIVITY OF FUTURE PHYSICIAN SUPPLY TO FUTURE CALIFORNIA EDUCATIONAL OUTPUT (40)

	Change in Growth Rate	1985 California Graduates		Active Physicians per 100,000	
		Number	Change	Number	Change
Base Case		18,2[illegible]2		243	
Alternative 1	+2.5%	18,827	+4%	246	+1%
Alternative 2	+5.0%	19,536	+8%	248	+2%
Alternative 3	+10.0%	21,288	+18%	255	+5%

These results show, as would be expected, that the future California supply of physicians is quite sensitive to the rate of growth in educational output. Each percentage of increase in the growth rate relative to the base case rate produces about a .5% increase in the number of physicians per 100,000.

Table IV- 13 also illustrates the significant implications for educational output requirements of changes in the target ratio of physicians per 100,000. The .5% increase in the ratio implies almost a 1.8% increase in the level of graduate output. Thus, each percentage change in the 1985 ratio corresponds to about a 3.6% change in output.

b. Migration

From past trends it was assumed in the base case projection that the in-migration rate of physicians trained outside the State would be equal to 9.3% of the total number trained in the United States each year and that the retention rate for California graduates was .7. As with the assumption on the rate of growth of graduate output, the methodology can also be used to examine the impacts of changes in migration patterns.

Consider, first, the in-migration rate. Table IV-14 shows the impacts of changes in the rate of inflow.

TABLE IV-14

SENSITIVITY OF FUTURE CALIFORNIA PHYSICIAN SUPPLY TO FUTURE IN-MIGRATION(40)

	In-Migration		1985 Active Physicians per 100,000	
	Rate	Change	Number	Change
Base Case	.093		243	
Alternative 1	.083	-10%	238	-3%
Alternative 2	.070	-25%	230	-5%
Alternative 3	.046	-50%	217	-11%

These results indicate that future supply is relatively insensitive to changes in the assumed rate of in-migration for the ranges considered.

TABLE IV-15

SENSITIVITY OF FUTURE CALIFORNIA PHYSICIAN SUPPLY TO THE RETENTION OF CALIFORNIA GRADUATES

	California Graduate Retention		1985 Active Physicians per 100,000	
	Rate	Change	Number	Change
Base Case	.701		243	
Alternative 1	.666	-5.0%	242	-.5%
Alternative 2	.631	-10.0%	241	-.9%

Table IV-15 shows the impact of changes in the retention rate of California graduates on future supply. As can be seen from this table, the physicians per 100,000 ratio is also insensitive to the assumed rate of retention (or conversely, the rate of out-migration) for the range of changes considered.

TABLE IV-16

TABLE IV-16. ETHNIC ORIGINS AND SEX OF ENTERING MEDICAL CLASSES
1975-76

SCHOOL	ETHNIC ORIGIN					TOTAL	SEX	
	Asian American	Black	Caucasian	Chicano	Other*		M	F
UCB Medical Option	2	1	8	1	0	12	7	5
UCD	8	8	77	6	3	102	73	29
UCI	0	6	51	12	1	70	57	13
UCLA	-	5	128	10	2	145	107	38
UCSD	11	2	74	5	4	96	84	12
UCSF	15	12	97	18	6	148	89	59
Loma Linda	13	124	16	2	7	162	123	39
Stanford	3	10	62	8	3	86	60	26
USC	12	13	93	18	3	139	20	19
C.R. Drew	112	22	10	5	7	156	137	19
TOTALS	176	203	616	85	36	1,116	857	259

*Includes Native Americans

Compiled from data submitted to the California Health Manpower Study Office by individual medical schools, Spring 1976.

Educational Opportunities

In the 1973-74 academic year there were 1,001 first-year medical students from California. Two-thirds of those students attended schools in California, while the remainder attended out-of-state schools. Forty-six percent of all first year students from California were attending one of the five University of California Medical Schools.

Californians made up 8% of all entering medical students for 1974-75. The State ranked 26th in the country in entering students per 100,000 population with 5.0 compared to a national average of 6.4. Similarly, the number of entering students from California per 1,000 bachelor's degrees awarded, 13.7, was 27th in the nation (national average was 15.6). By way of comparison, New York, with about the same number of bachelor's degrees awarded as California had 55% more entering medical students.

Of the 3,783 applicants from California for the 1973-74 entering medical school class, 1,093 or 28.9% were accepted. This percentage for California compares with a national acceptance rate of 35.4%.

In regard to the sex of entering medical school students in California there has been a rapid expansion of females; from 11.1% in 1970-71 to 22.3% in 1974-75. The proportion ranges from 16% at UCLA to 36% at UCSF. The 1975-76 figures show females comprising 30% of the entering class of medical students. (See Table IV-16.)

The minority representation in the entering medical school classes has more than doubled in the last six years. In the entering class of 1975-76 37% of the students were from minority backgrounds. Asian Americans appear to be well represented making up 7% of the entering class of students;

Asian Americans, it should be noted however constitute only 2.6% of the State population. Blacks, making up 7% of the State's population constitute 19% of the entering class of students; while Mexican-Americans representing 11% of the population of the State only represent 8% of the students in the 1975-76 entering class. C.R. Drew which is a postgraduate medical school was not considered when computing the above, but is a facility that enrolls predominantly minority students. Lastly, in 1974, 10% of all Black intern-residents in the U.S. were being trained in California.

One measure of whether a state's medical school applicant rejectees are receiving fair opportunity is comparison of their qualifications with rejectees from other states. In 1975-76, residents from only one state, Washington, who were not accepted into medical school had higher average MCAT science scores than the California rejectees. In fact, the mean science score (577) for the California rejectees was greater than the mean science score for 1,250 resident acceptees from South Carolina, North Dakota, North Carolina, Mississippi, Louisiana and Alabama. The mean undergraduate grade point average of Californians not accepted was 3.18 compared to 3.10 nationally. More significantly, the mean MCAT science score was 637 for Californians accepted to medical school as compared to the national average of 616 for accepted applicants.

Rovnanek (15) recently conducted a follow-up study of medical school rejectees from the University of Caifornia--Berkeley campus. She found that 50% of the non-acceptees reapplied for medical school the following year and that 13% were accepted. Additional studies of California non-acceptees are needed to make definitive generalizations regarding their final career choice.

TABLE IV-17

NUMBER OF ENTERING PLACES, CALIFORNIA APPLICANTS AND ACCEPTANCES--1969-1975

	No. of Entering Places Available			No. of California Applicants			No. of Californians Accepted		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
1969-1970	9,474	948	10,422	1,867	209	2,076	665	65	730
1970-1971	10,092	1,256	11,348	1,982	264	2,246	735	98	833
1971-1972	10,668	1,693	12,361	2,342	376	3,718	753	120	873
1972-1973	11,377	2,300	13,677	2,940	583	3,523	822	210	1,032
1973-1974	11,338	2,786	14,124	3,045	738	3,783	841	252	1,093
1974-1975	11,488	3,275	14,763	3,162	933	4,095	974	309	1,183

SOURCE: Association of American Medical Colleges.

These analyses show that California has a large proportion of qualified students relative to the space available in the entering classes of its medical schools. A great number of these students are able to attend school out of state, yet, many qualified applicants are disappointed and it may well be that many qualified and interested students are discouraged from ever applying. (See Table IV-17.) There is also a continuing need for recruitment of qualified person from low income families, particularly Mexican-Americans for medical school admission.

There is also a question regarding whether California, an immigration M.D. state, ought not to produce a larger share of the nation's physicians. Simply increasing total medical school student slots, however, probably would not guarantee a proportionate increase in the number of practicing physicians in the State, according to analyses of Blumberg and Wing.(4) Therefore, California must critically appraise the issue of "opportunity" for California's potential medical school students versus the need for increased primary care physicians, particularly in underserved areas. In other words, how can California best utilize its limited medical educational resources to increase "opportunity" for undergraduate medical education students or by changing the graduate residency specialty mix. This is a prominent issue for health manpower policy makers in California.

3. UNMET DEMAND

Senate Bill No. 1224, or the Song Brown Family Physician Training Act of October 1973 created a Health Manpower Policy Commission and designated it the task of determining specific areas of the State where unmet priority needs for primary care family physicians exist.

The geographic areas designated as primary care physician shortage areas by the Commission are divided into two categories: Critical Shortage Areas and Underserved Primary Care Areas. The critical Shortage Areas exhibit extreme deviation from primary physician access that is available to the majority of the California population. The second category of Underserved Areas represent areas that exhibit similar deficiencies though not as extreme. This second category should not be viewed as less deficient because for the most part the areas represented contain much larger populations and the lack of primary care physicians poses a potentially serious problem to the residents of these areas.

The criteria employed herein is composed of 1) geographic location or remoteness from physicians and/or appropriate medical facilities; 2) age distribution of the population (d.g. percent sixty-five years of age and older and precent five years of age and younger); 3) race or ethnic identity; 4) physician to population ratio for primary care physicians and for total physicians providing patient care: 5) the designation of primary care physician scarcity areas used by the Secretary of Health, Education and Welfare, Section 1302 of the Public Health Service Act and portions of the National Health Service Corps listing of medically underserved areas.

The following areas are considered to be Critical Shortage Areas: the entire counties of Alpine, Del Norte, Glenn, Imperial, Kern, Kings, Madera, Merced, Modoc, Mono, San Benito, Solano, Sutter, Tehama, and Tulare. Portions of Alameda County--fourteen census tracts in the city of Oakland; Humboldt County--the north coastal census county division (city of Trinidad and surroundings); Los Angeles County--seventy-five census tracts in seven health service areas; San Diego County--the census county divisions of Jumal, Palomar-Laguna, Pauma Valley-Valley Center and sixteen census tracts primarily in the city of San Diego; San Francisco County--seven census tracts in the downtown area and; Sonoma County--the census county divisions of Cloverdale-Geyserville and Russian River-Coastal.

Additionally, the following counties exhibit low primary care physician to population ratios and low overall physician to population ratios that while not as severe nor as remote as the critically short areas, are well below the statewide norm and are designated as Underserved Primary Physician Care Areas. These counties are deficient in primary care accessibility: Amador, El Dorado, Fresno, Inyo, Lake, Lassen, Monterey, Riverside, San Bernardino, San Joaquin, Sierra, Siskiyou, Trinity, Tuolumne, Ventura and Yuba.

Based on estimated 1973 population data, the population of the critically short counties excluding the populations of the census tract areas was 1,182,956. For the potentially short areas the population was 2,856,645. Thus, when the population of the various census tracts (approximately 500,000) is included, it appears that roughly 22% of the population of California is in need of additional primary care physicians.

(See Table IV-18 and Maps 1-26 which follow)

TABLE IV-18

THE AREAS OF UNMET NEED FOR FAMILY PHYSICIANS AS DECLARED BY THE HEALTH MANPOWER POLICY COMMISSION

PART A – "Critical shortage areas"

Within the County of Alameda, City of Oakland:

The census tracts 4013, 4018, 4019, 4021, 4026, 4028, 4029, 4030, 4034, 4037, 4053, 4077, 4088, and 4274.

The County of Alpine
The County of Del Norte
The County of Glenn

Within the County of Humboldt:

The North Coastal census county division.
The Trinity-Klamath census county division.

The County of Imperial
The County of Kern
The County of Kings

Within the County of Los Angeles:

The census tracts 1902.00, 1916.01, 1923.00, 1945.00, 2031.00, 2034.00, 2045.01, 2061.00, 2062.00, 2063.00, 2073.00, 2077.00, 2078.00, 2079.00, 2087.00, 2088.00, 2089.00, 2092.00, 2093.00, 2094.00, 2095.00, 2098.00, 2113.00, 2118.00, 2122.00, 2144.00, 2145.00, 2146.00, 2151.00, 2164.00, 2202.00, 2214.02, 2219.00, 2264.00, 2281.00, 2282.00, 2283.00, 2288.00, 2289.00, 2291.00, 2293.00, 2391.00, 2396.00, 2408.00, 2409.00, 2421.00, 2422.00, 2423.00, 2426.00, 2427.00, 2428.00, 2431.00, 2734.00, 4019.02, 4088.00, 4636.00, 5328.00, 5352.00, 5354.00, 5404.00, 5406.00, 5716.00, 5725.00, 5728.00, 5759.00, 5760.00, 5761.00, 5762.00, 5763.00, 5765.00, 5766.00, 5767.00, 7014.00, 7019.00.

TABLE IV-18 (continued)

Within the County of Mendocino:

The Point Arena census county *division.*

The County of Madera
The County of Merced
The County of Modoc
The County of Mono
The County of San Benito

Within the County of San Diego:

The census tracts 0003, 0007, 0013, 0048, 0052, 0053, 0056, 0057, 0059, 0060, 0066, 0082, 0170, 0185.02, 0186.03, 0200.01.

The Jamul census county division
The Palomar-Laguna census county division
The Pauma Valley – Valley Center census county division

Within the County of San Francisco:

The census tracts 0114, 0115, 0123, 0124, 0125, 0155, and 0176.

The County of Solano

Within the County of Sonoma:

The Cloverdale-Geyserville census county division
The Russian River-Coastal census county *division*

The County of Sutter
The County of Tehama
The County of Tulare

PART B – "Underserved areas"

The County of Amador
The County of El Dorado
The County of Fresno

TABLE IV-18 (continued)

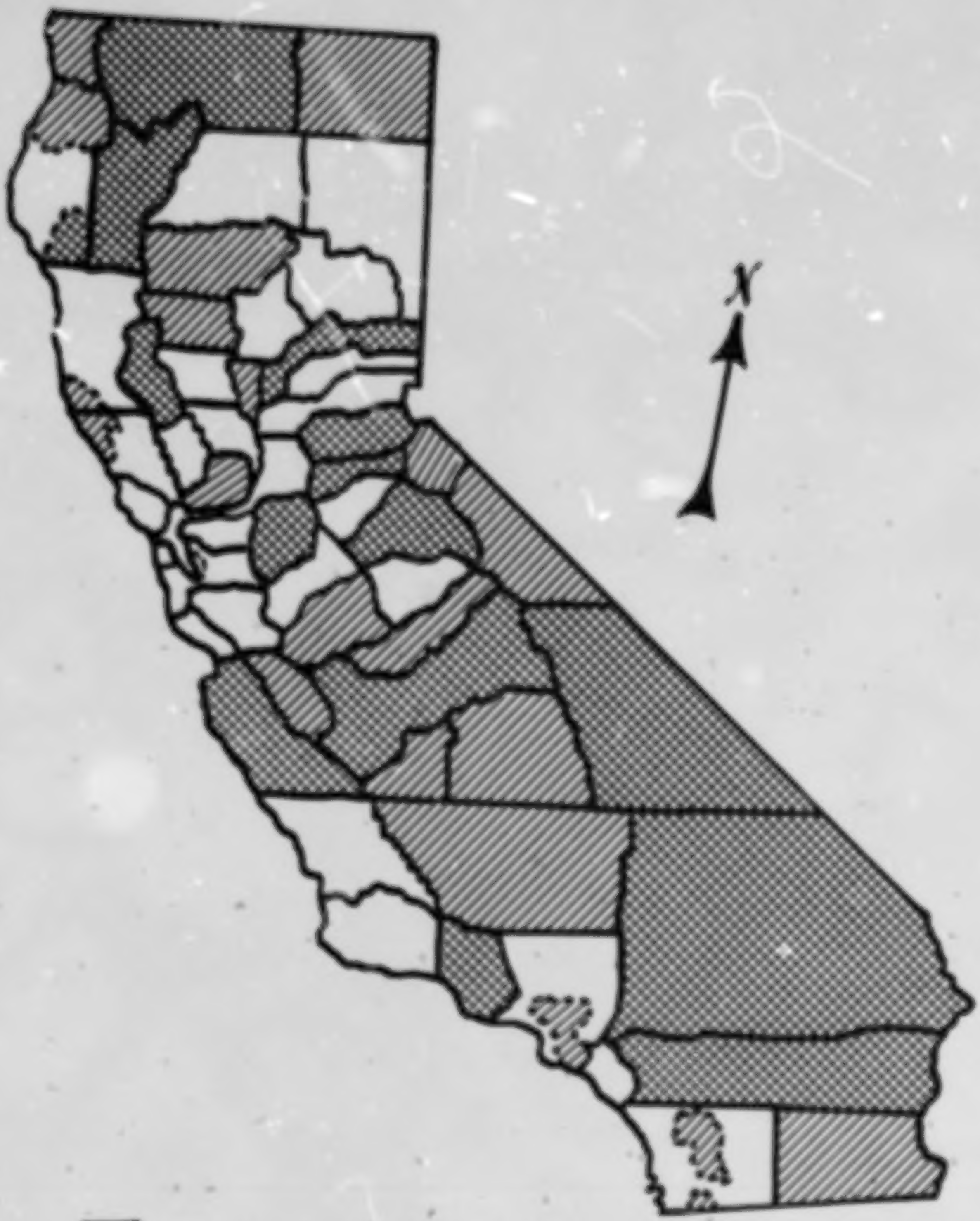
Within the County of Humboldt:

The Garberville census county division

The County of Inyo
The County of Lake
The County of Monterey
The County of Riverside
The County of San Bernardino
The County of San Joaquin
The County of Sierra
The County of Siskiyou
The County of Trinity
The County of Tuolumne
The County of Ventura
The County of Yuba

MAP 1

CALIFORNIA – PRIMARY CARE PHYSICIAN SHORTAGE AREAS



▨ Primary Care Physician Critical Shortage Areas

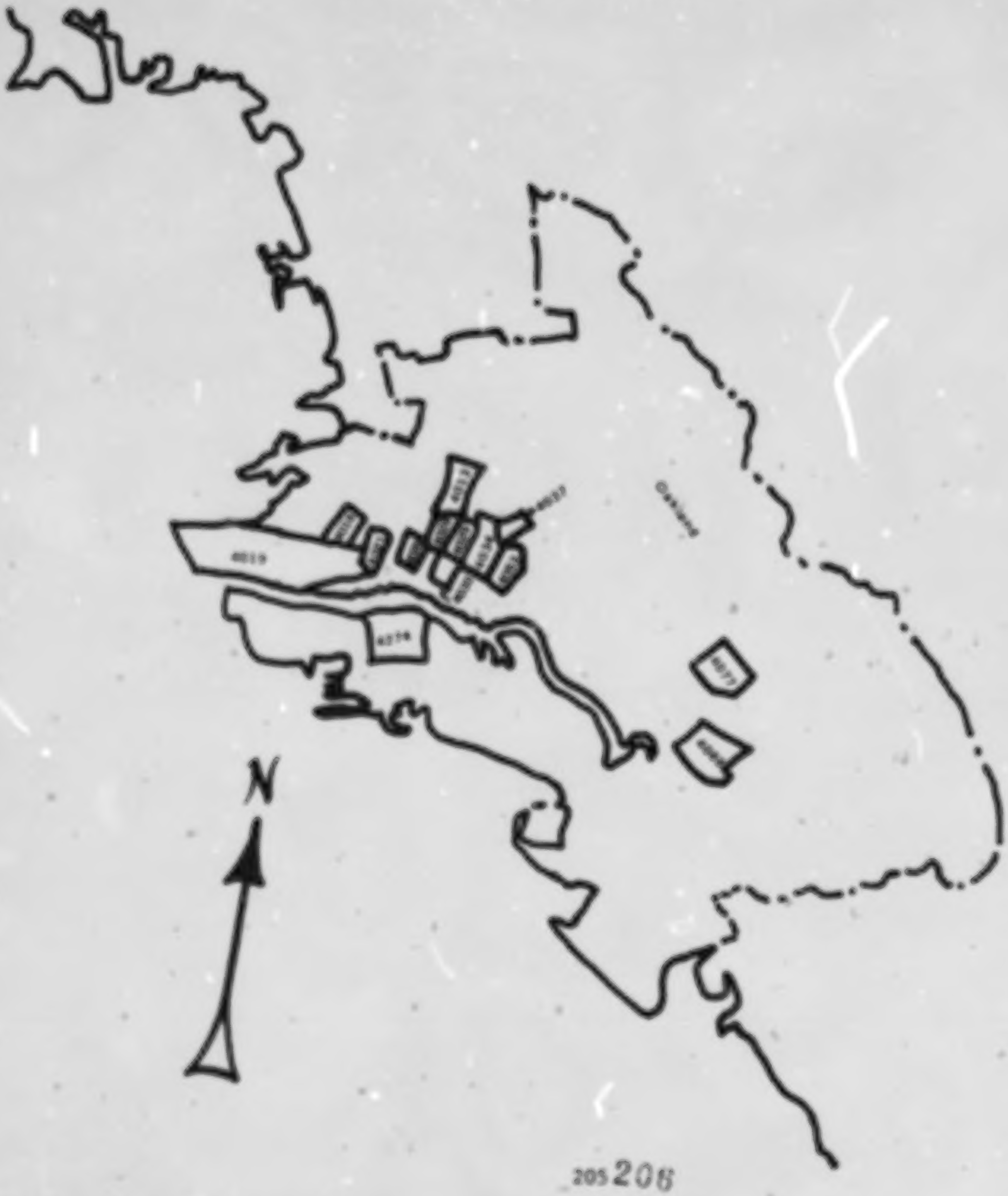
▩ Primary Care Physician Underserved Areas

⬚ Shortage Areas within Counties

MAP 2

Alameda County -- Detail Map 1

123 Shortage Area Census Tracts



MAP 3

Los Angeles County – See Detail Maps I – VI

▨ Primary Care Physician Critical Shortage Areas

N
Detail Map I
Detail Map II
Detail Map III
Detail Map IV
Detail Map V
Detail Map VI

MAP 4

Los Angeles County

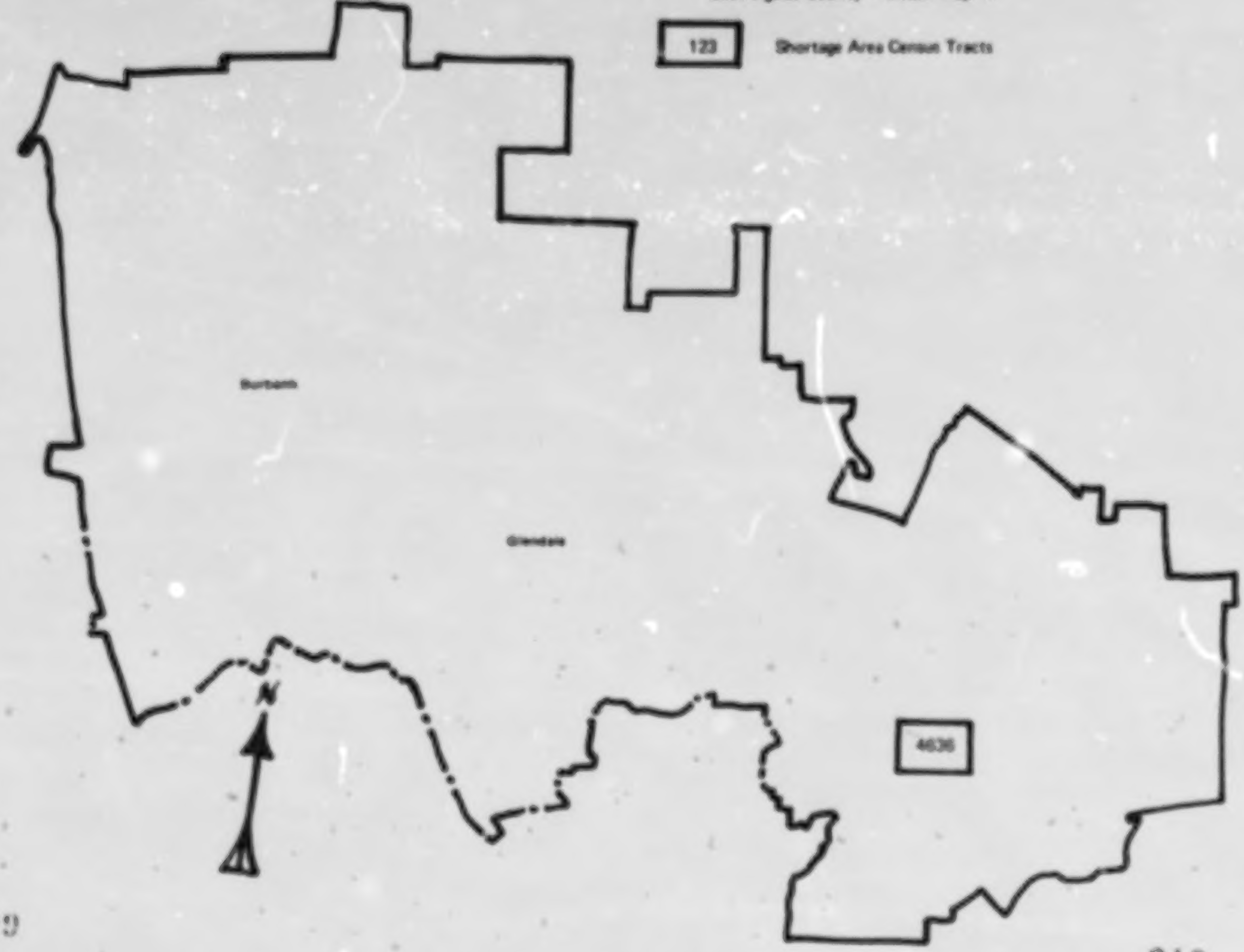
San Fernando
Ventura Co.
N
Santa Monica Bay

Los Angeles – Detail Map I

123 Shortage Area Census Tracts

MAP 5

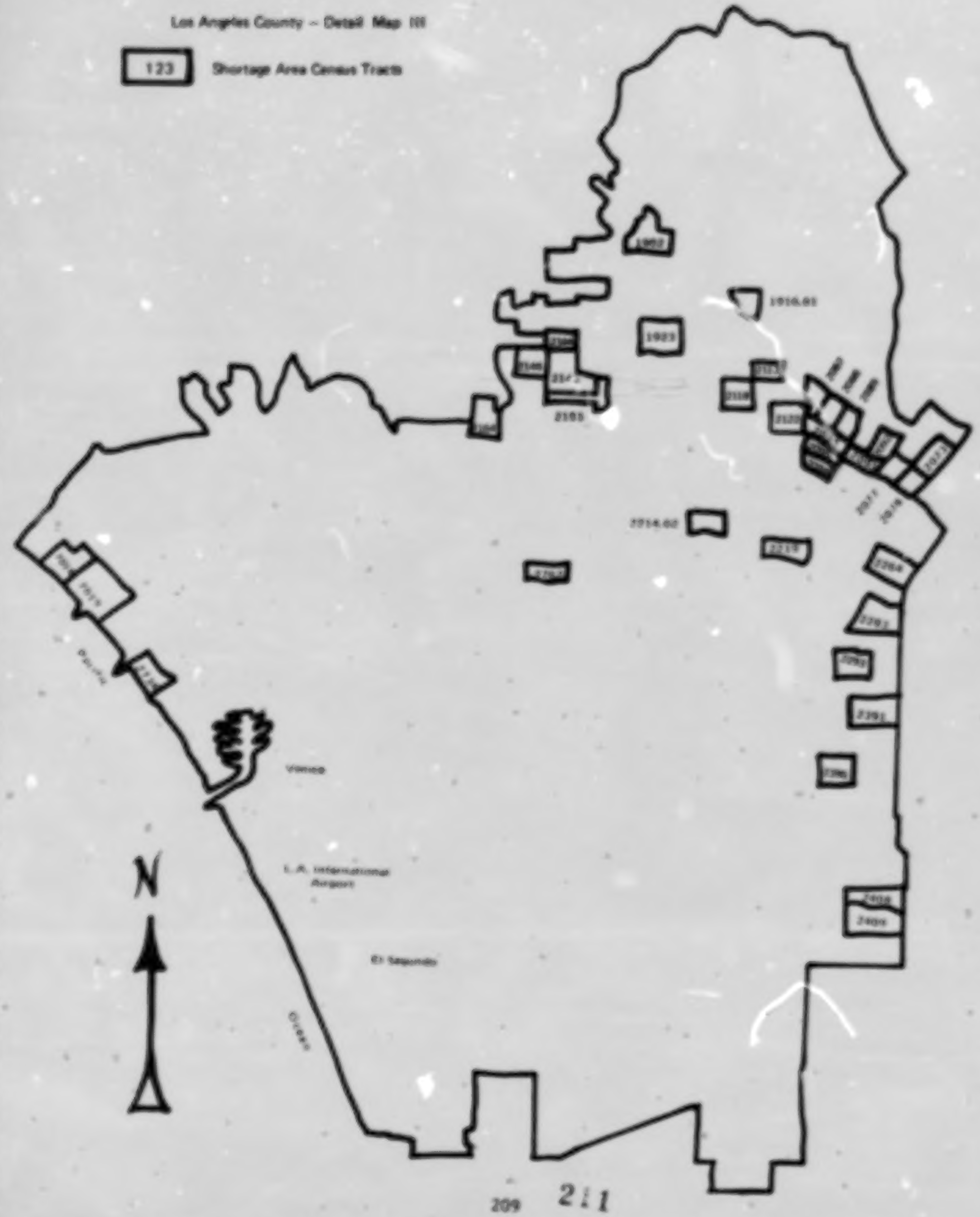
Los Angeles County – Detail Map 11

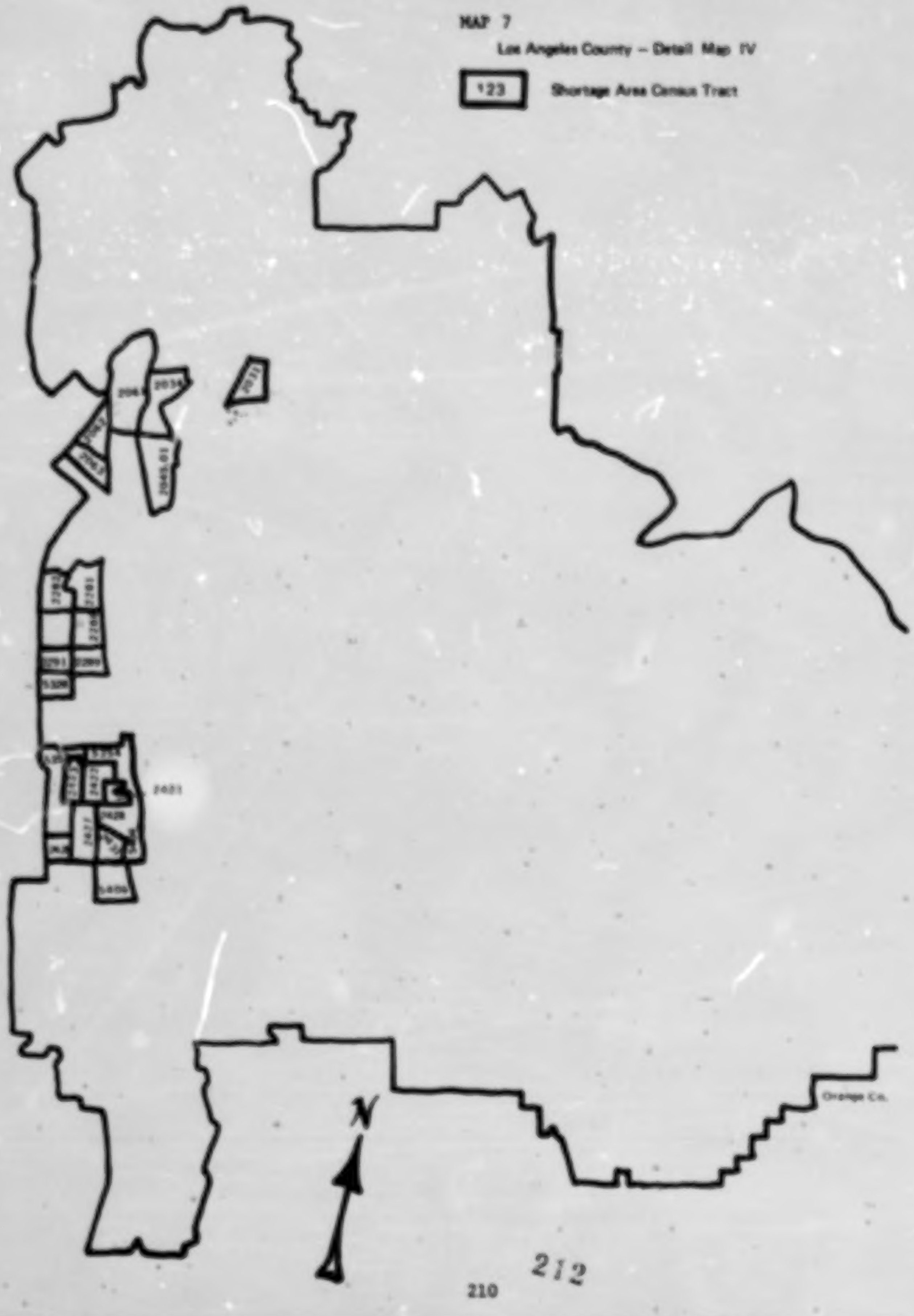

123
Shortage Area Census Tracts
Burbank
Glendale
N
4636

MAP 6

Los Angeles County -- Detail Map III

123 Shortage Area Census Tracts

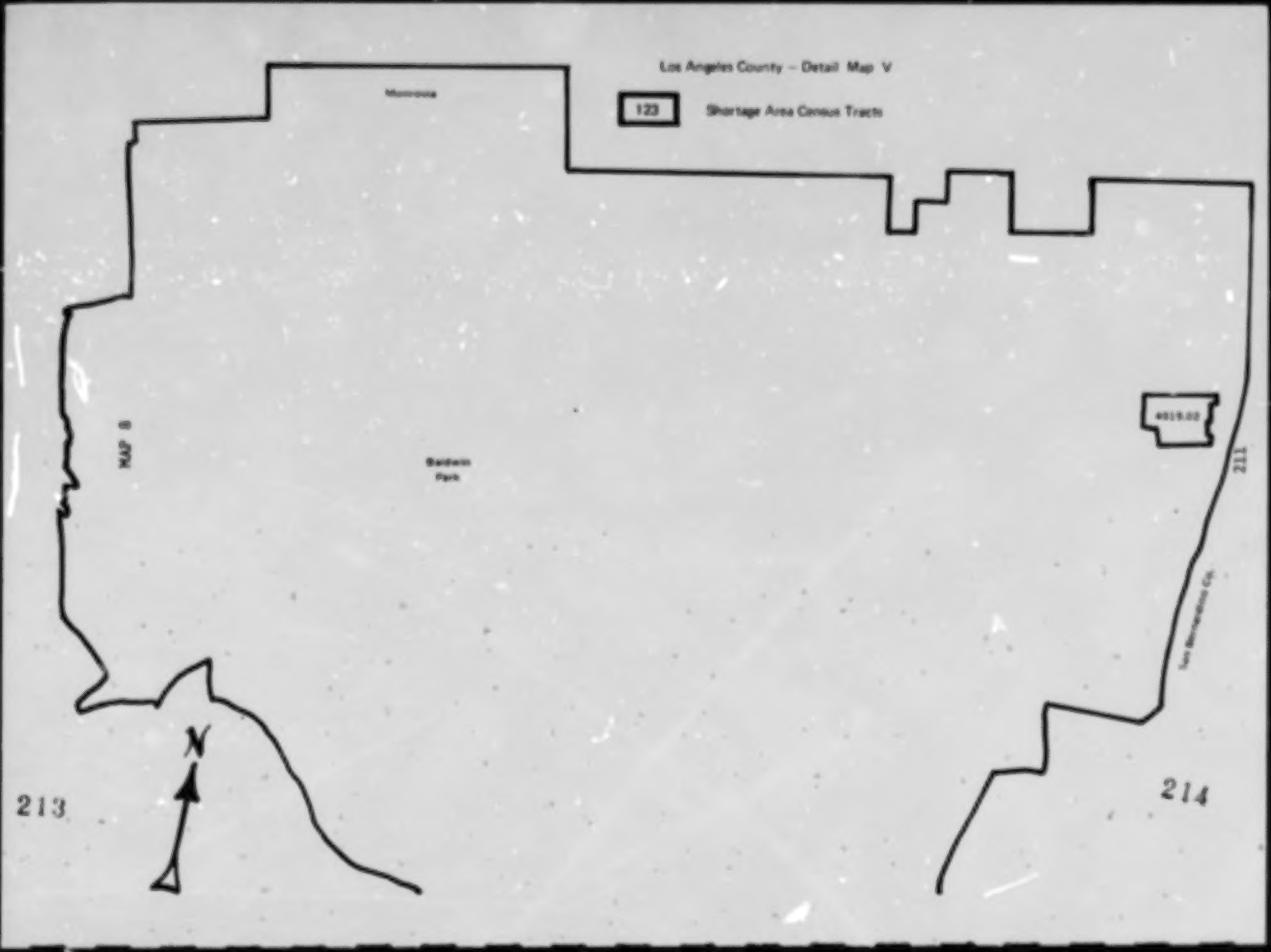

1902
1916.01
1923
2146
2151
2118
2120
2073
2071
2216
2214.02
2215
2264
Pacific
Venice
L.A. International Airport
El Segundo
Ocean
N



MAP 7

Los Angeles County – Detail Map IV

123
Shortage Area Census Tract
2034
2031
2049.01
2291
2289
2421
2428
2427
Orange Co.
N



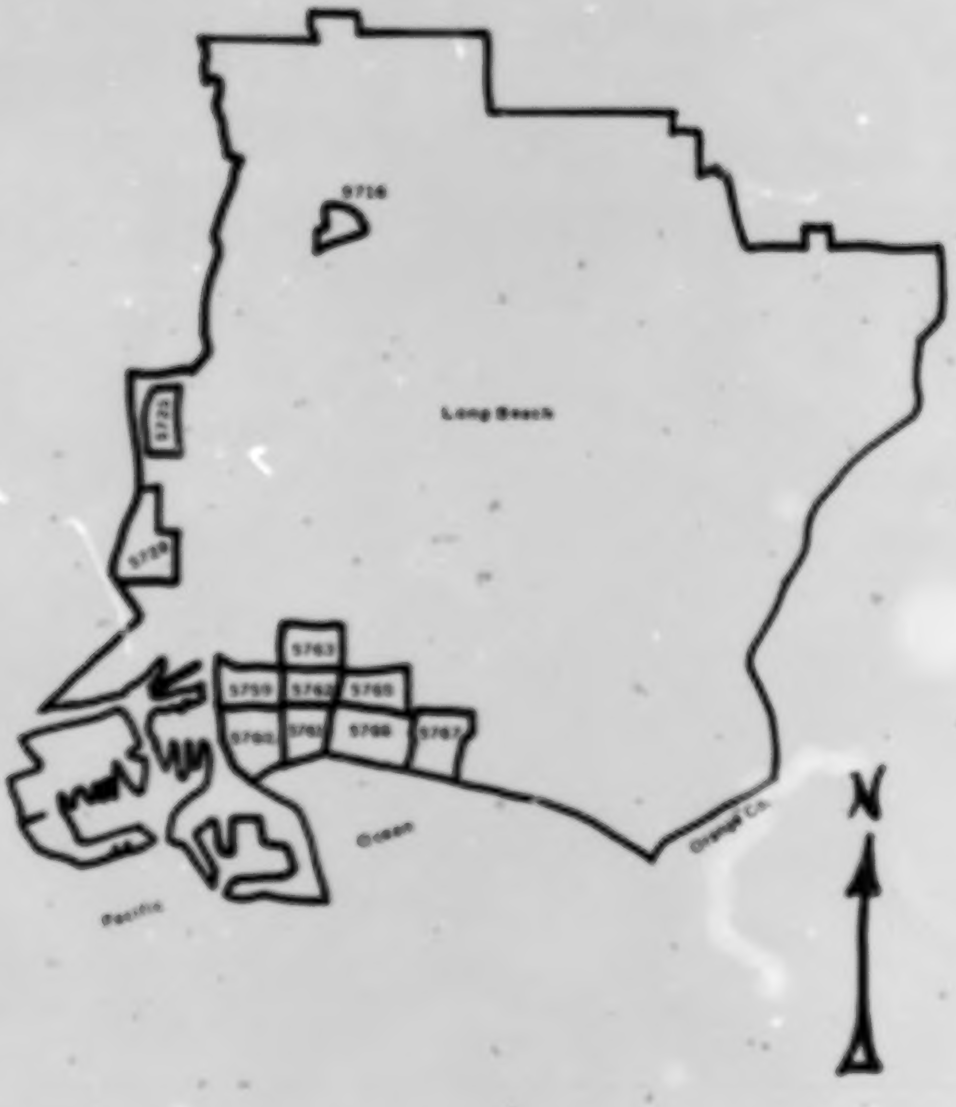
Los Angeles County – Detail Map V

123
Shortage Area Census Tracts
Monrovia
MAP 8
Baldwin Park
4019.02
211
San Bernardino Co.
N
213
214

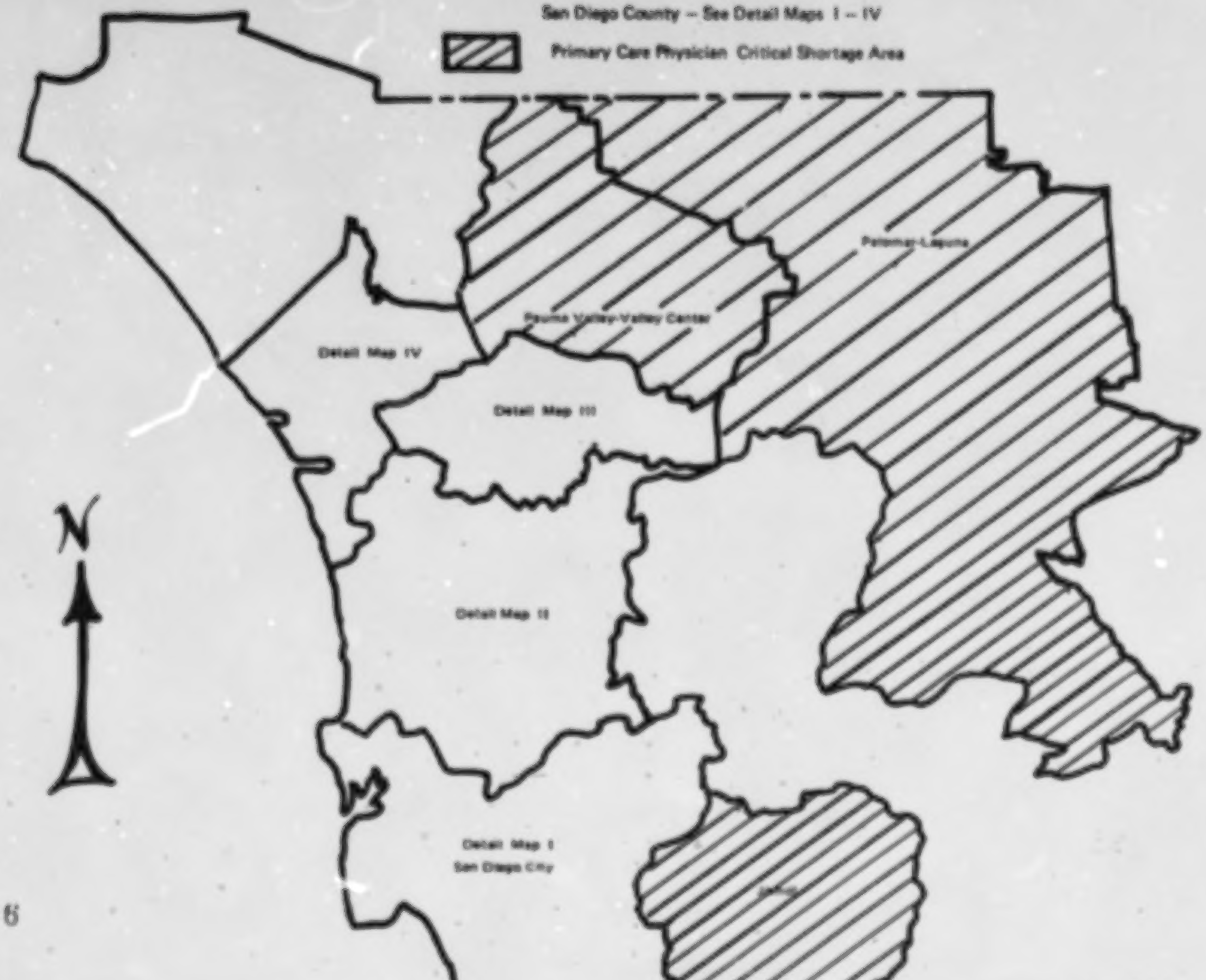
MAP 9

Los Angeles County -- Detail Map VI

123 Shortage Area Census Tracts

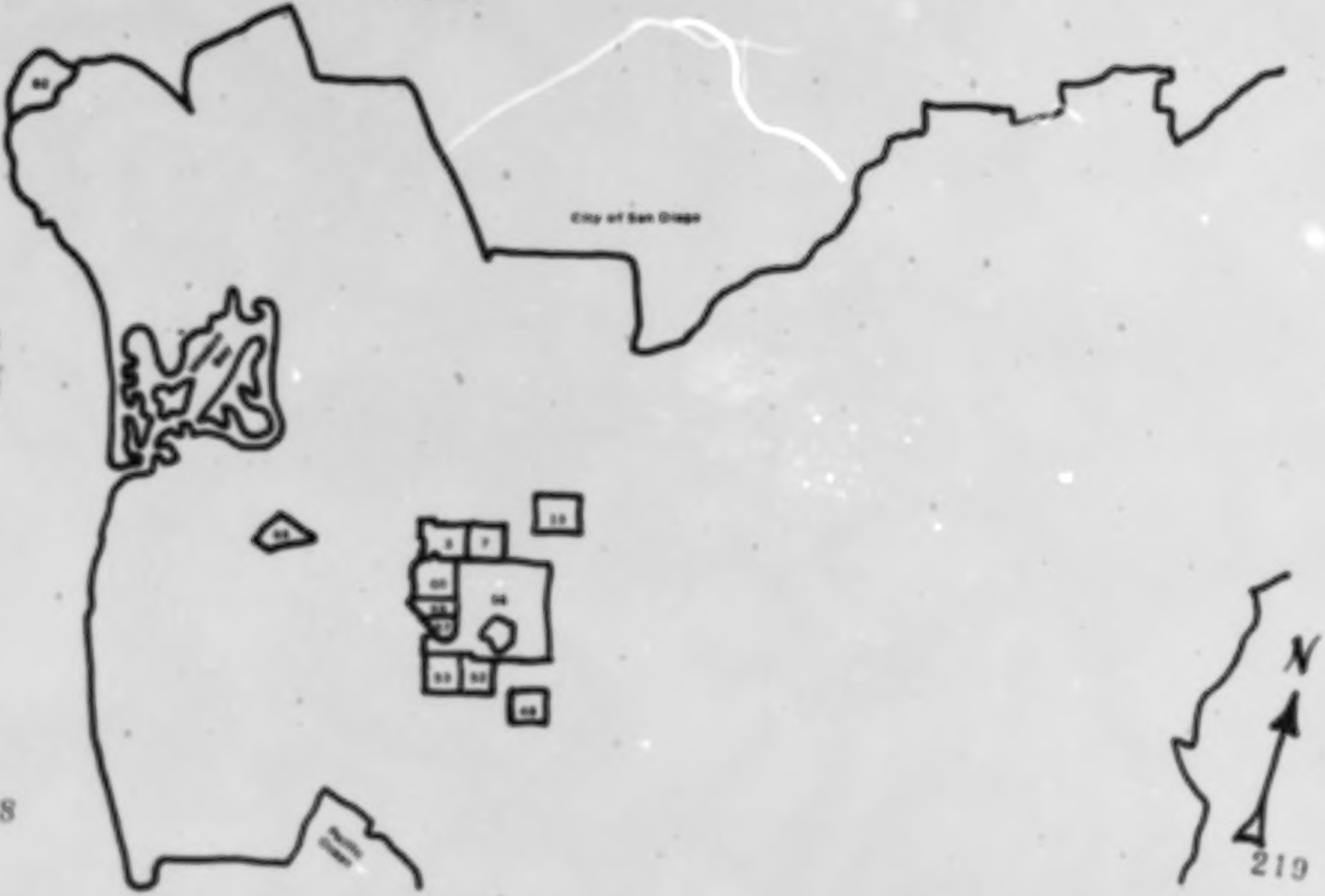

5716
5722
5729
Long Beach
5763
5759
5762
5765
5760
5761
5766
5767
Ocean
Pacific
Orange Co.
N

MAP 10


San Diego County – See Detail Maps I – IV
▨ Primary Care Physician Critical Shortage Area
Palomar-Laguna
Pauma Valley-Valley Center
Detail Map IV
Detail Map III
Detail Map II
Detail Map I
San Diego City
N

San Diego County – Detail Map 1

123 Shortage Area Census Tracts

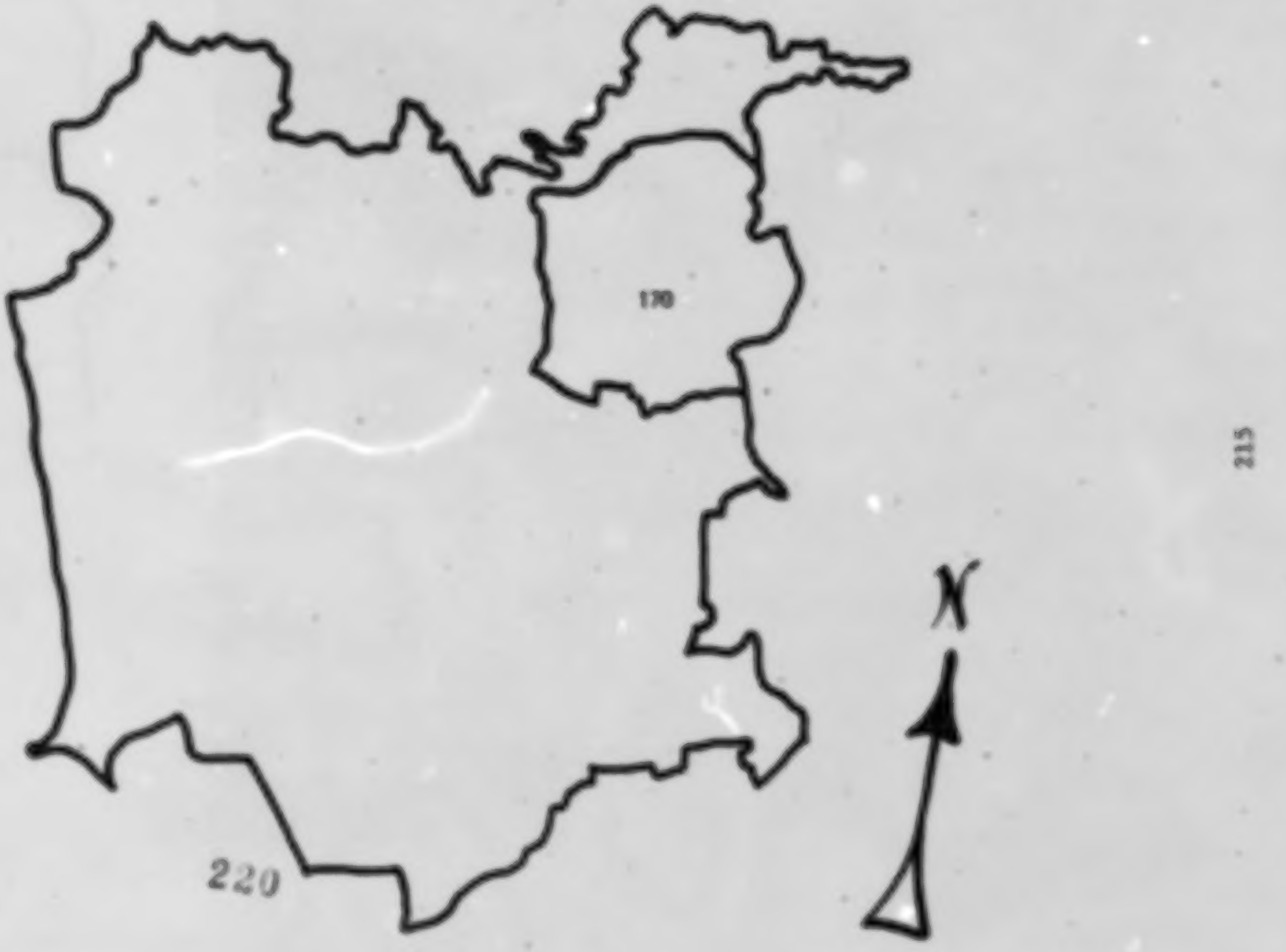

City of San Diego
MAP 11
214
6
7

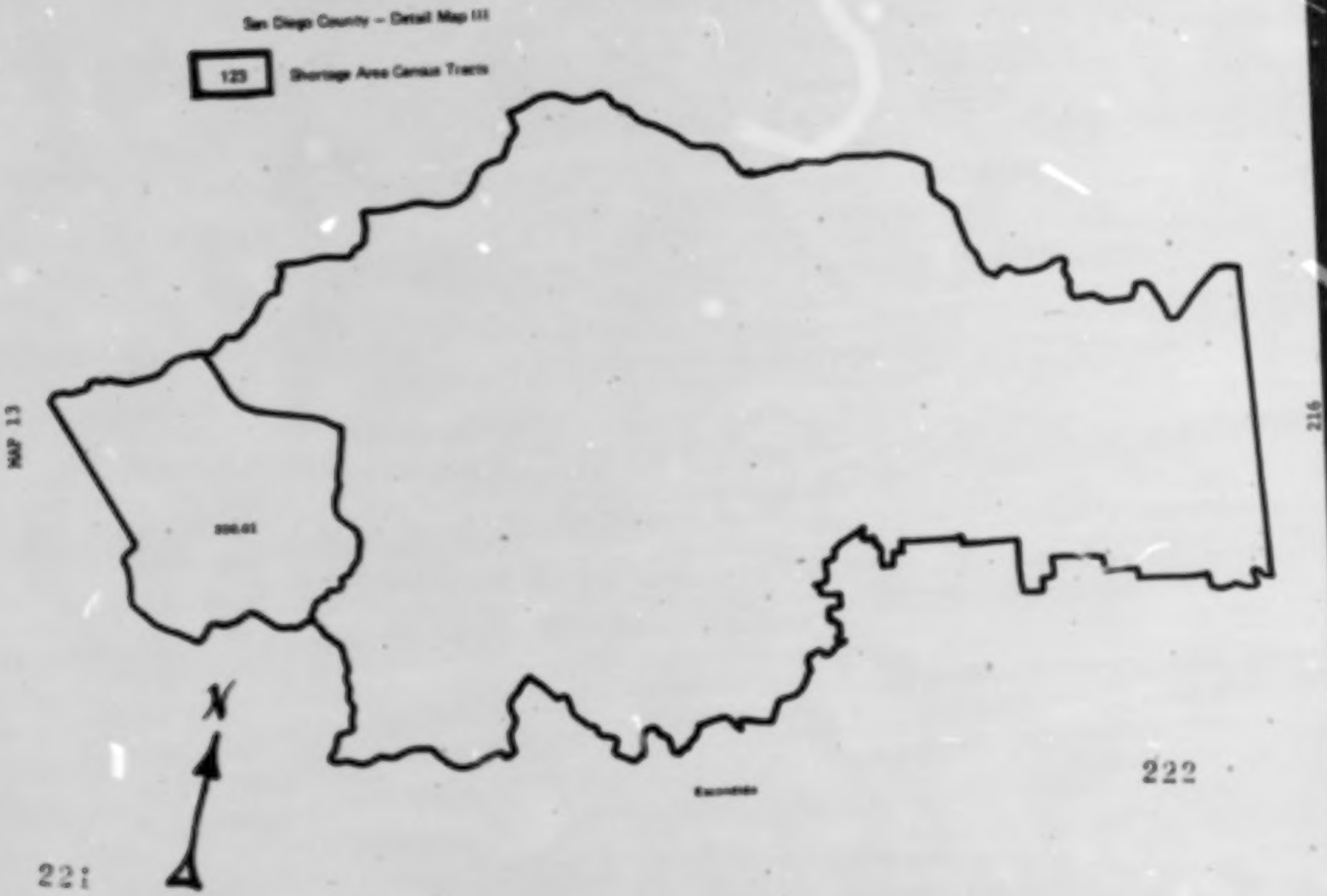
2i8

219

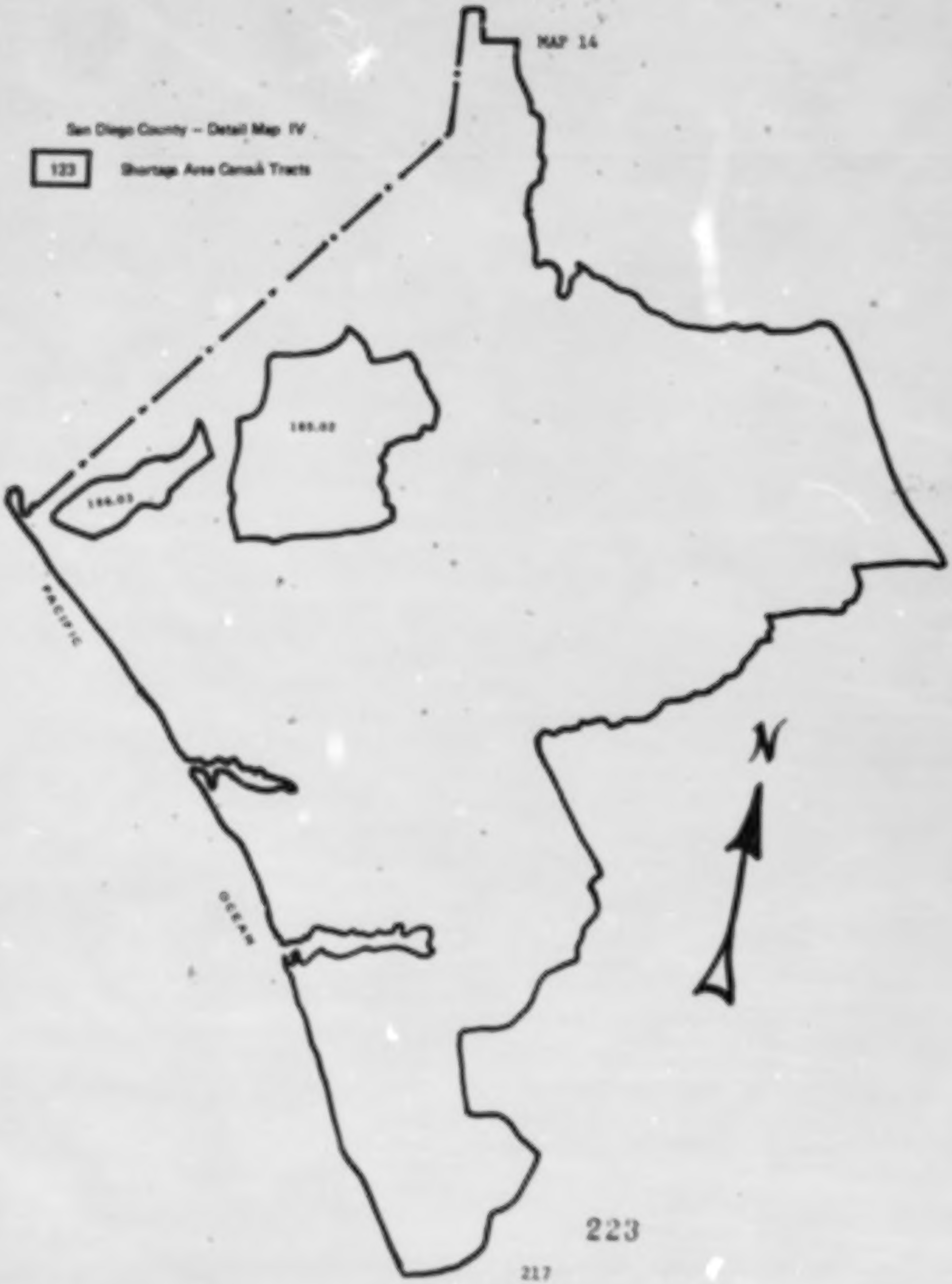
San Diego County -- Detail Map II

123	Shortage Area Census Tracts

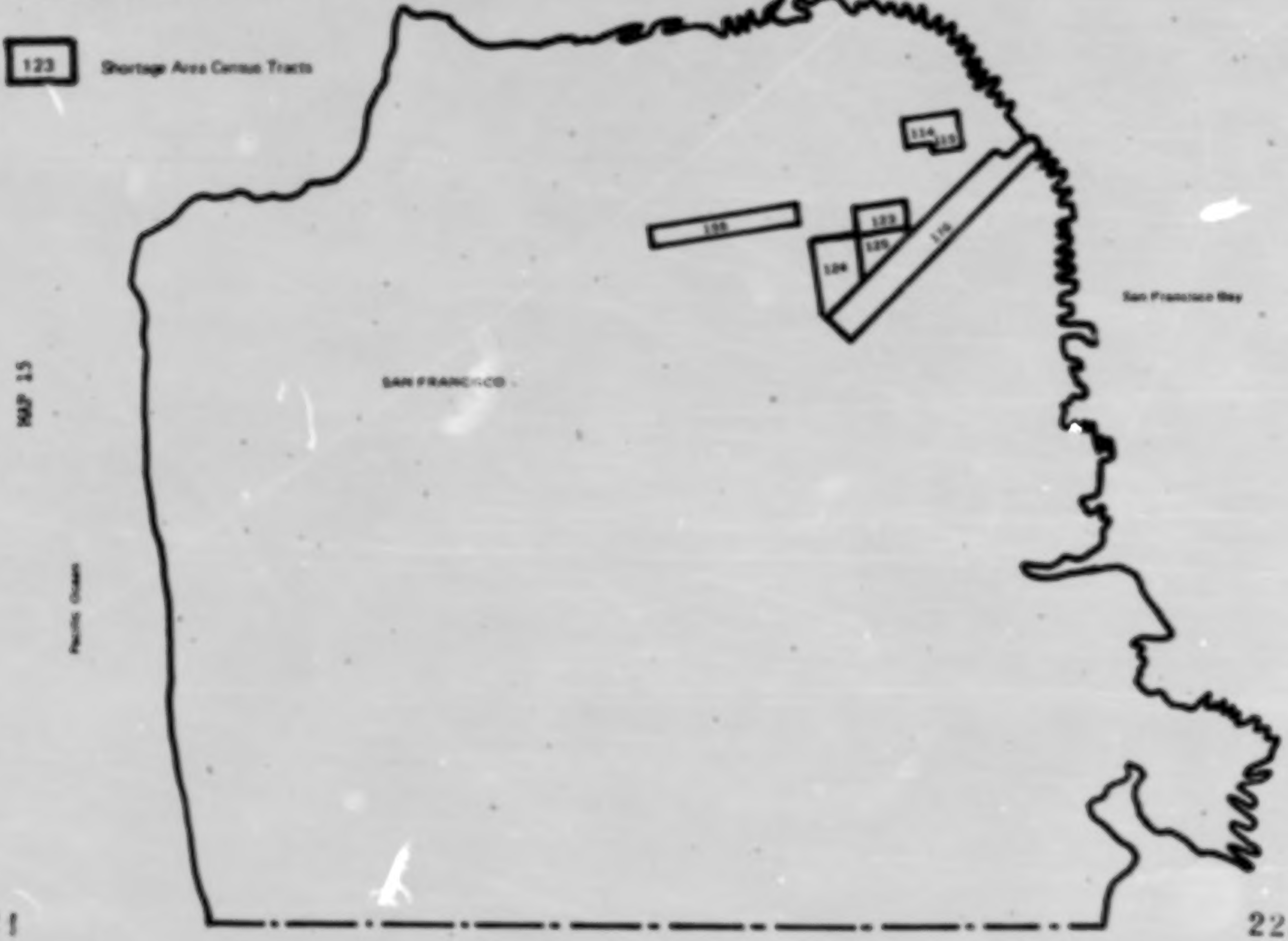

170
215
220
N


San Diego County – Detail Map III
123
Shortage Area Census Tracts
MAP 13
216
200.01
222
Escondido
N
221

MAP 14

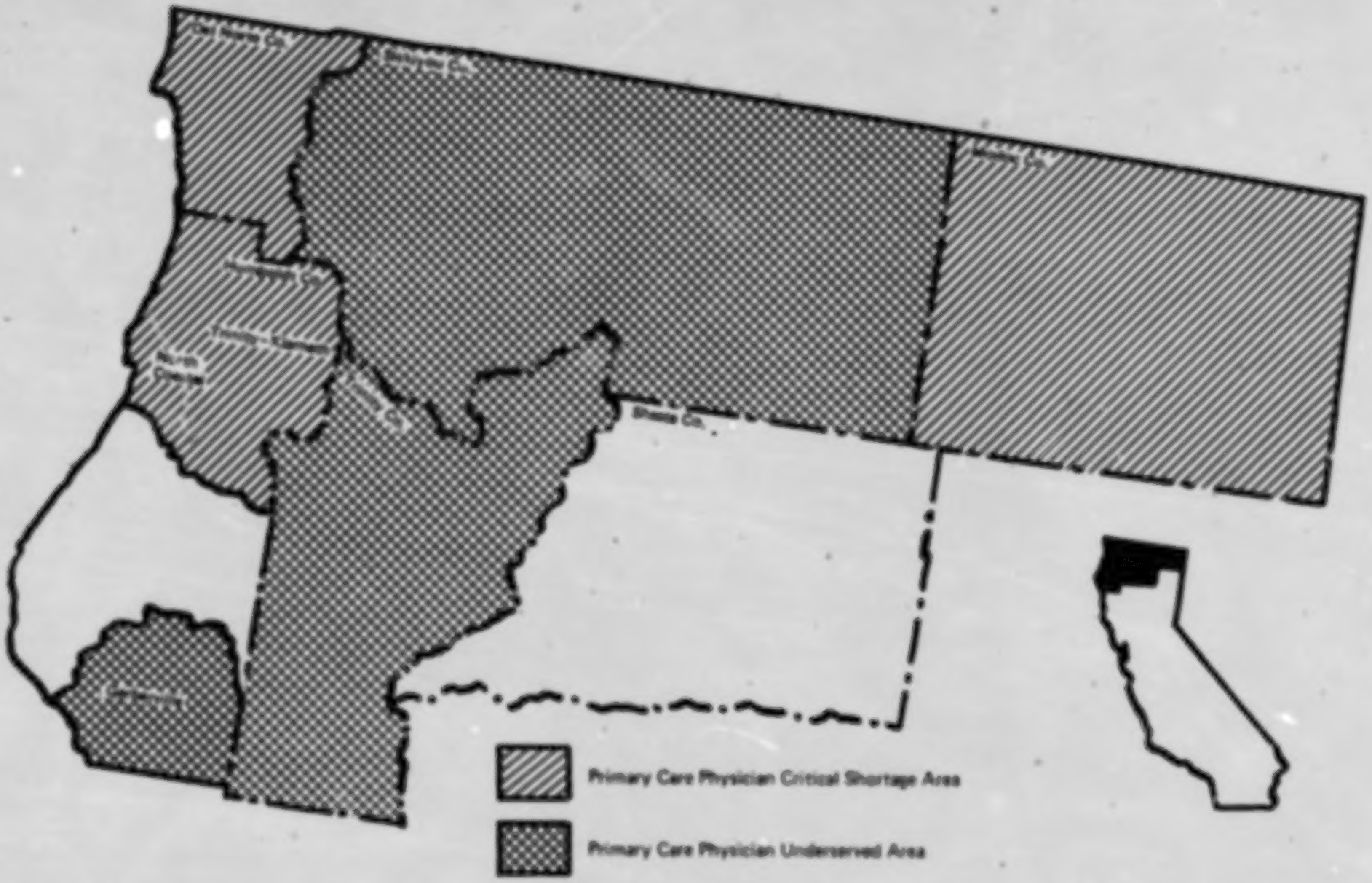

San Diego County -- Detail Map IV
123
Shortage Area Census Tracts
185.02
186.03
PACIFIC
OCEAN
N

County and City of San Francisco -- Detail Map II

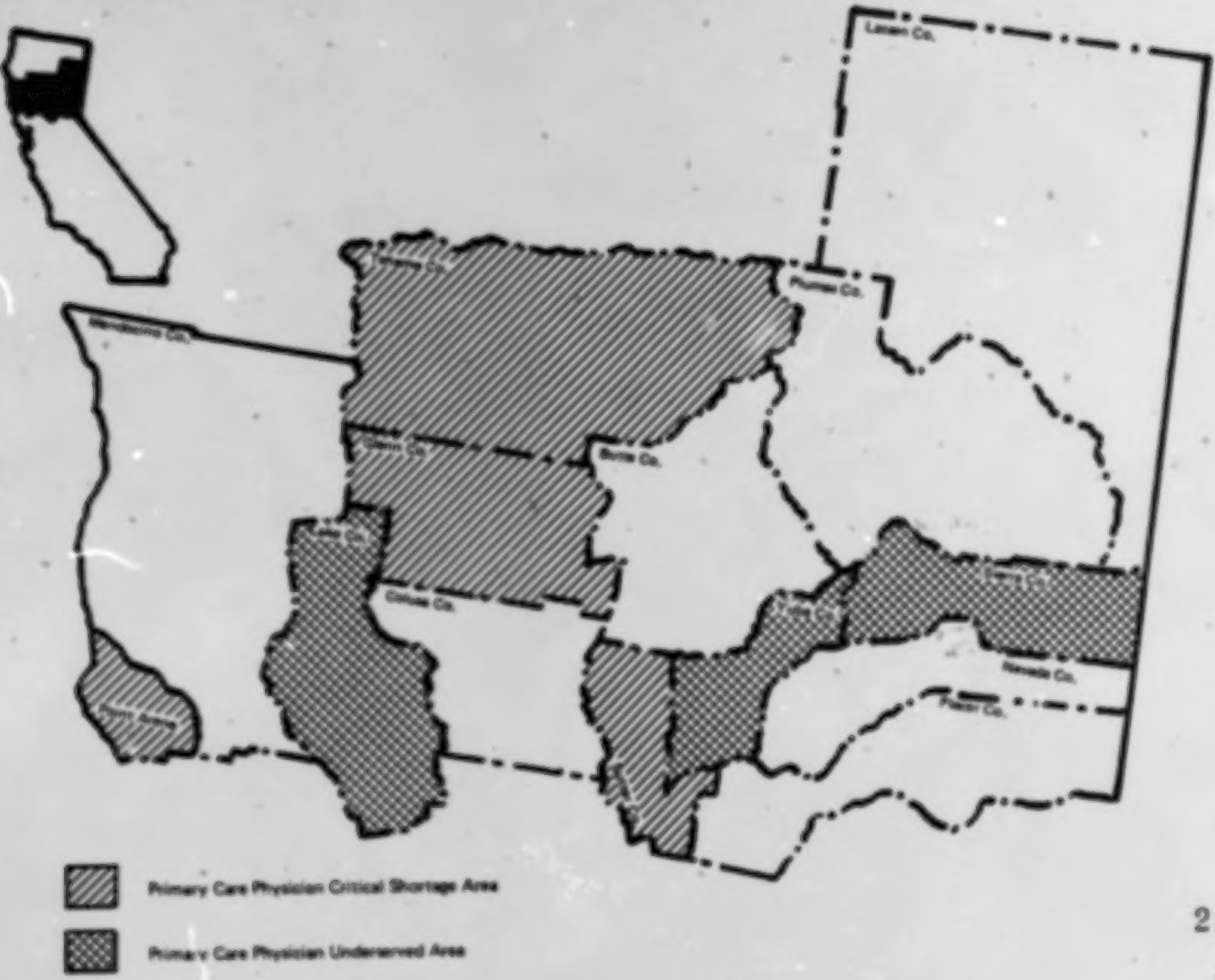

123
Shortage Area Census Tracts
114
115
128
123
125
124
176
SAN FRANCISCO
San Francisco Bay
Pacific Ocean

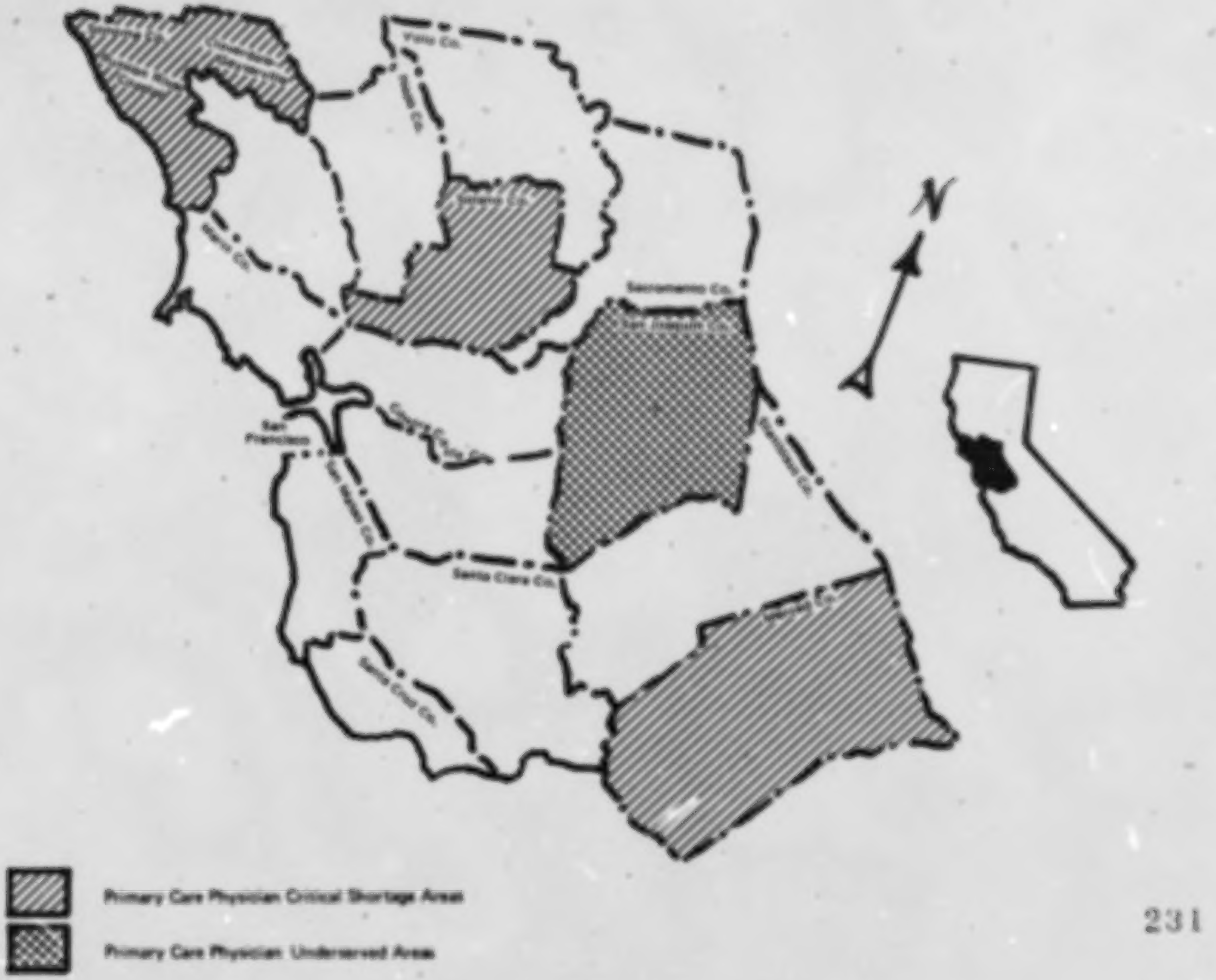
MAP 15

MAP 16


Del Norte Co.
Shasta Co.
▨ Primary Care Physician Critical Shortage Area
▩ Primary Care Physician Underserved Area

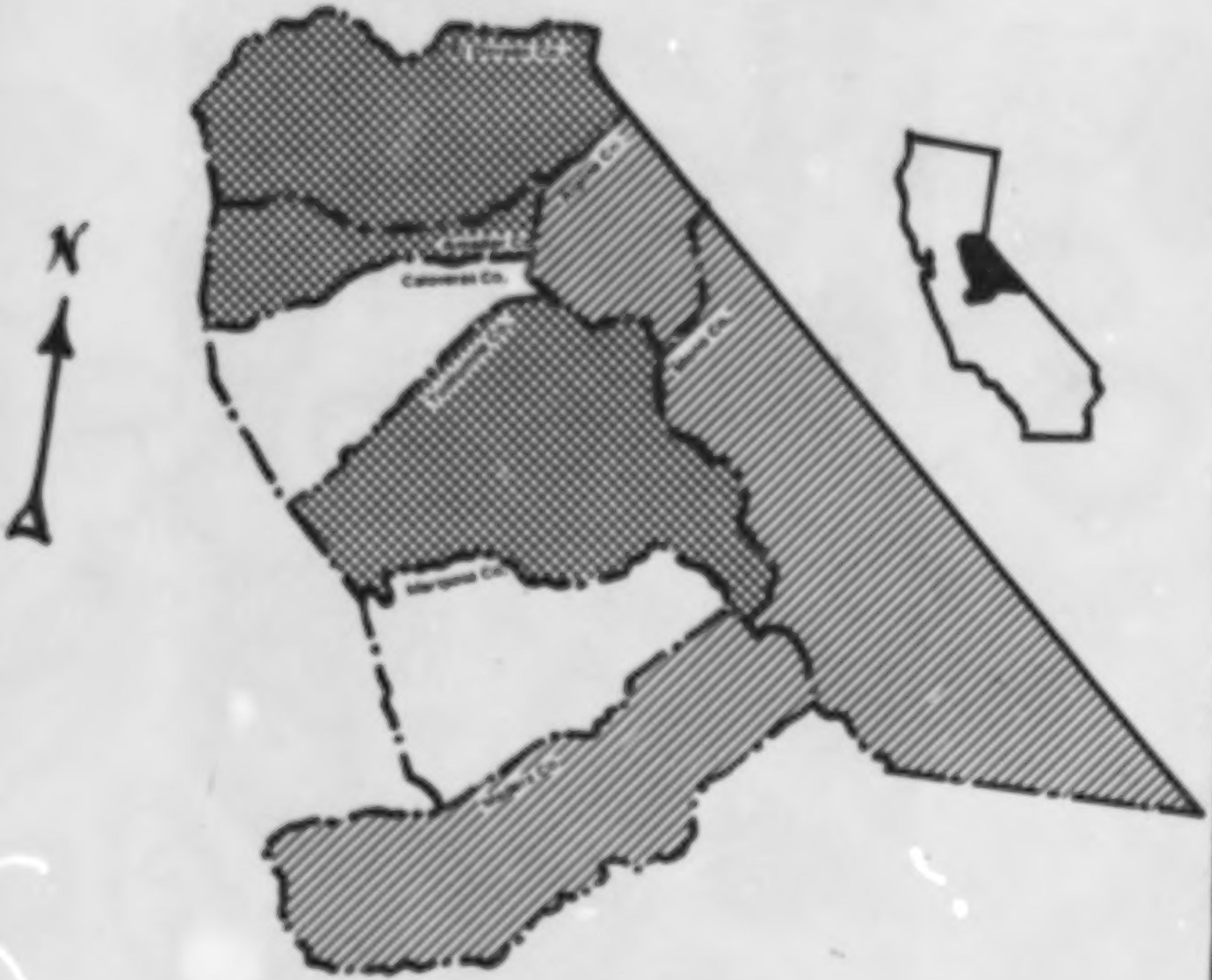
MAP 17


Lassen Co.
Tehama Co.
Plumas Co.
Mendocino Co.
Glenn Co.
Butte Co.
Lake Co.
Colusa Co.
Sierra Co.
Yuba Co.
Nevada Co.
Placer Co.
▨ Primary Care Physician Critical Shortage Area
▩ Primary Care Physician Underserved Area


Sonoma Co.
Yolo Co.
Napa Co.
Marin Co.
Solano Co.
Sacramento Co.
San Joaquin Co.
Contra Costa Co.
San Francisco
San Mateo Co.
Santa Clara Co.
Santa Cruz Co.
Stanislaus Co.
Merced Co.
N

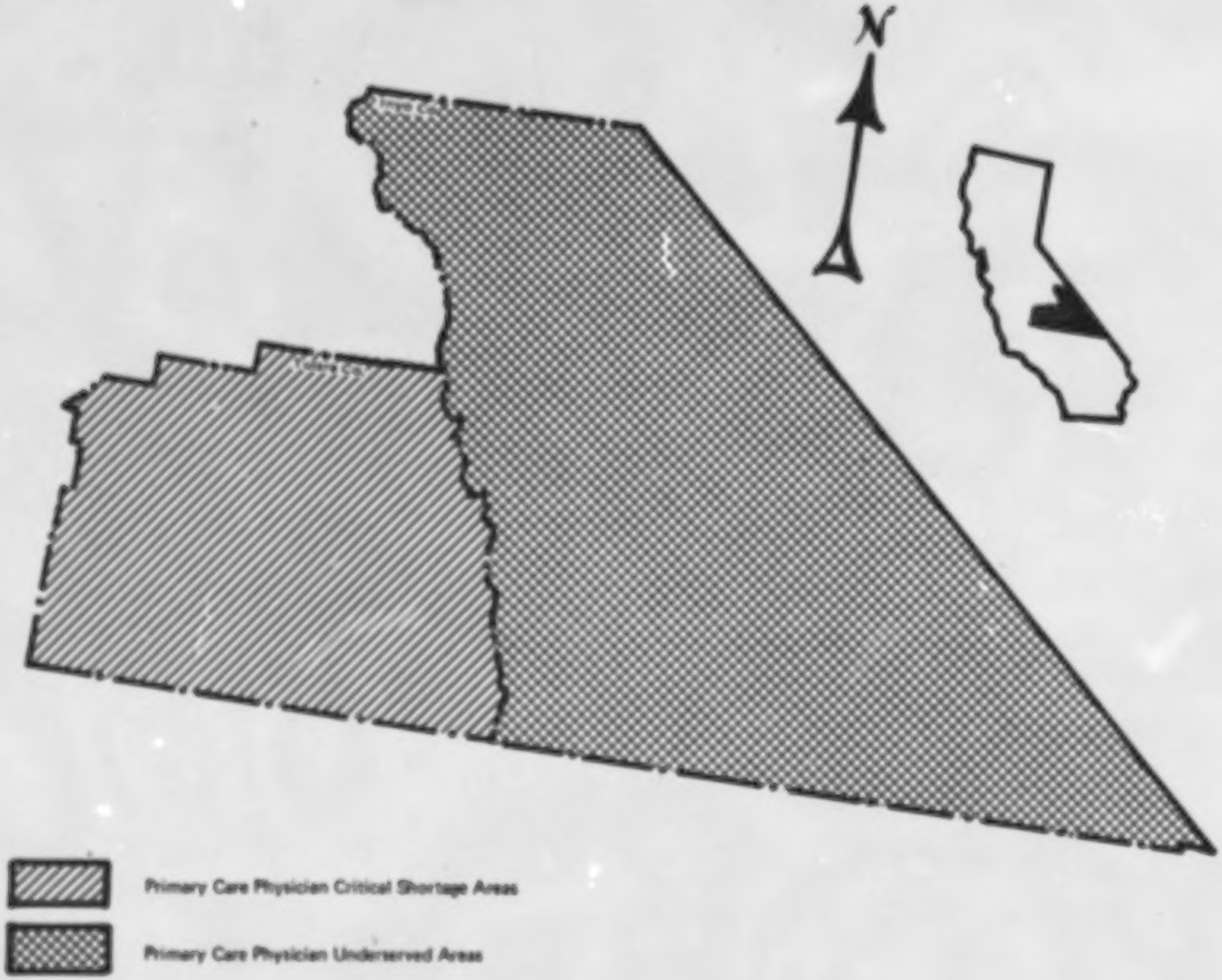
▨ Primary Care Physician Critical Shortage Areas

▩ Primary Care Physician Underserved Areas


N
Calaveras Co.
Mariposa Co.

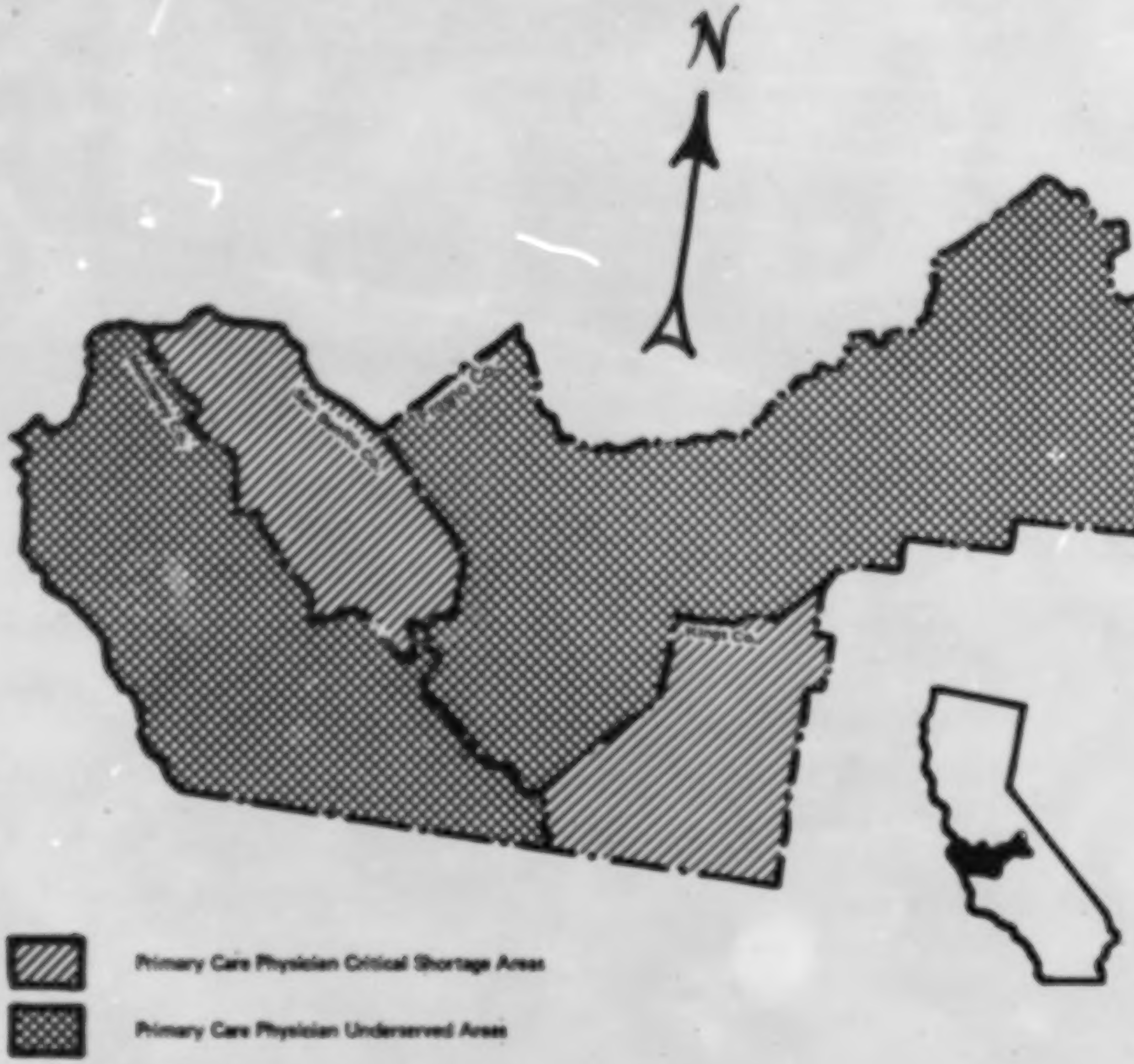
▨ Primary Care Physician Critical Shortage Areas

▦ Primary Care Physician Underserved Areas

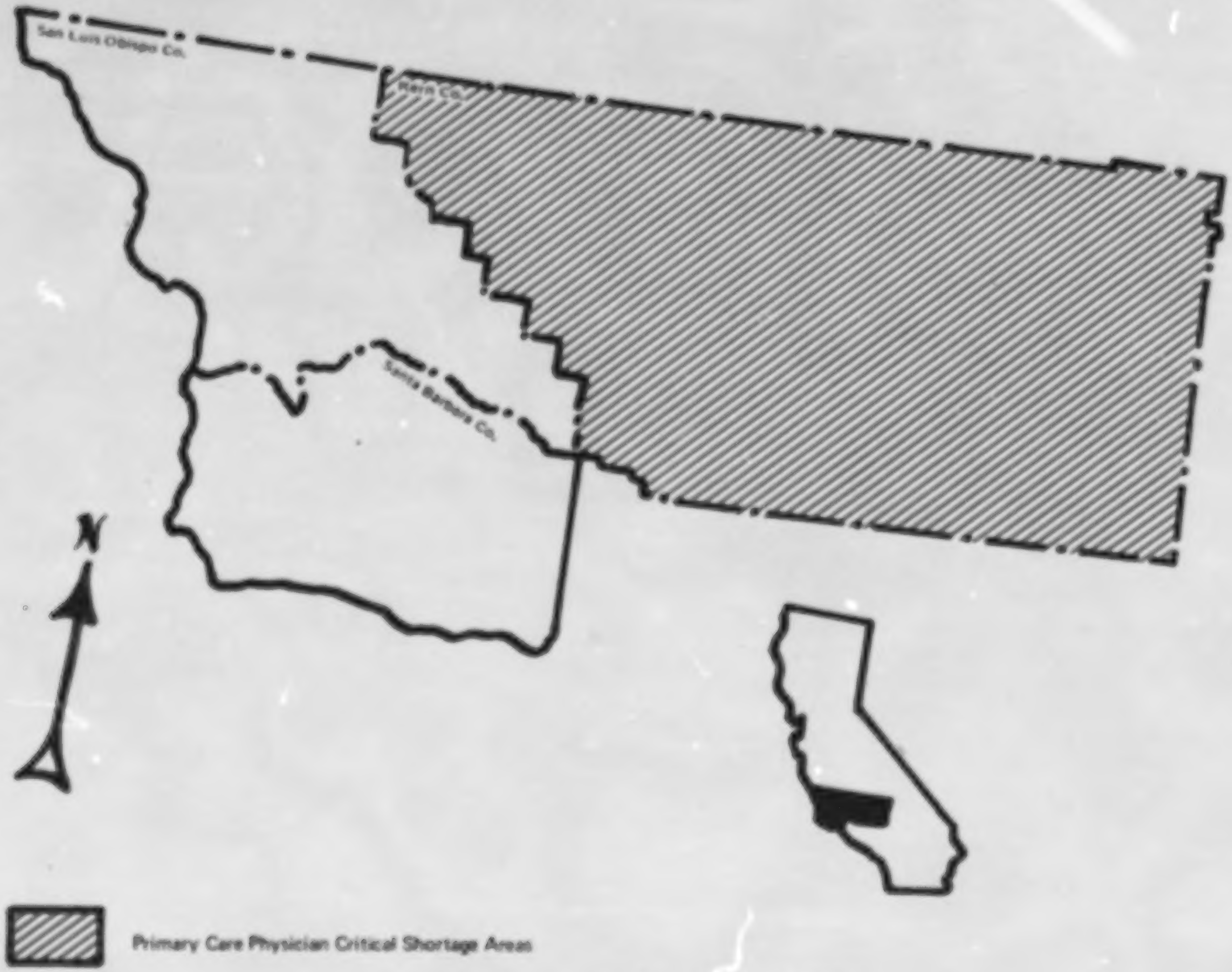

N
▨ Primary Care Physician Critical Shortage Areas
▩ Primary Care Physician Underserved Areas

MAP 20

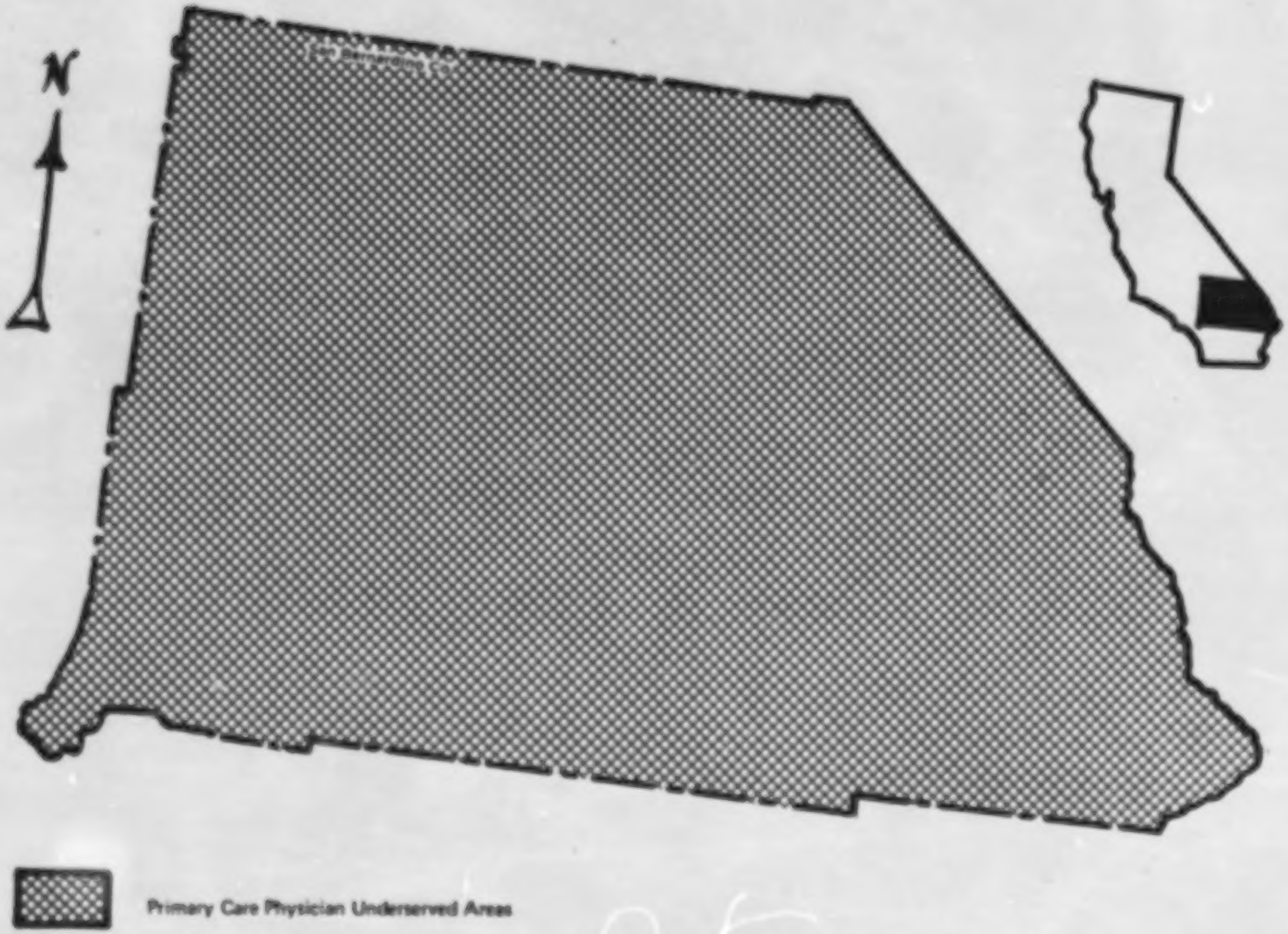
MAP 21


N
San Benito Co.
Fresno Co.
Kings Co.
Primary Care Physician Critical Shortage Areas
Primary Care Physician Underserved Areas

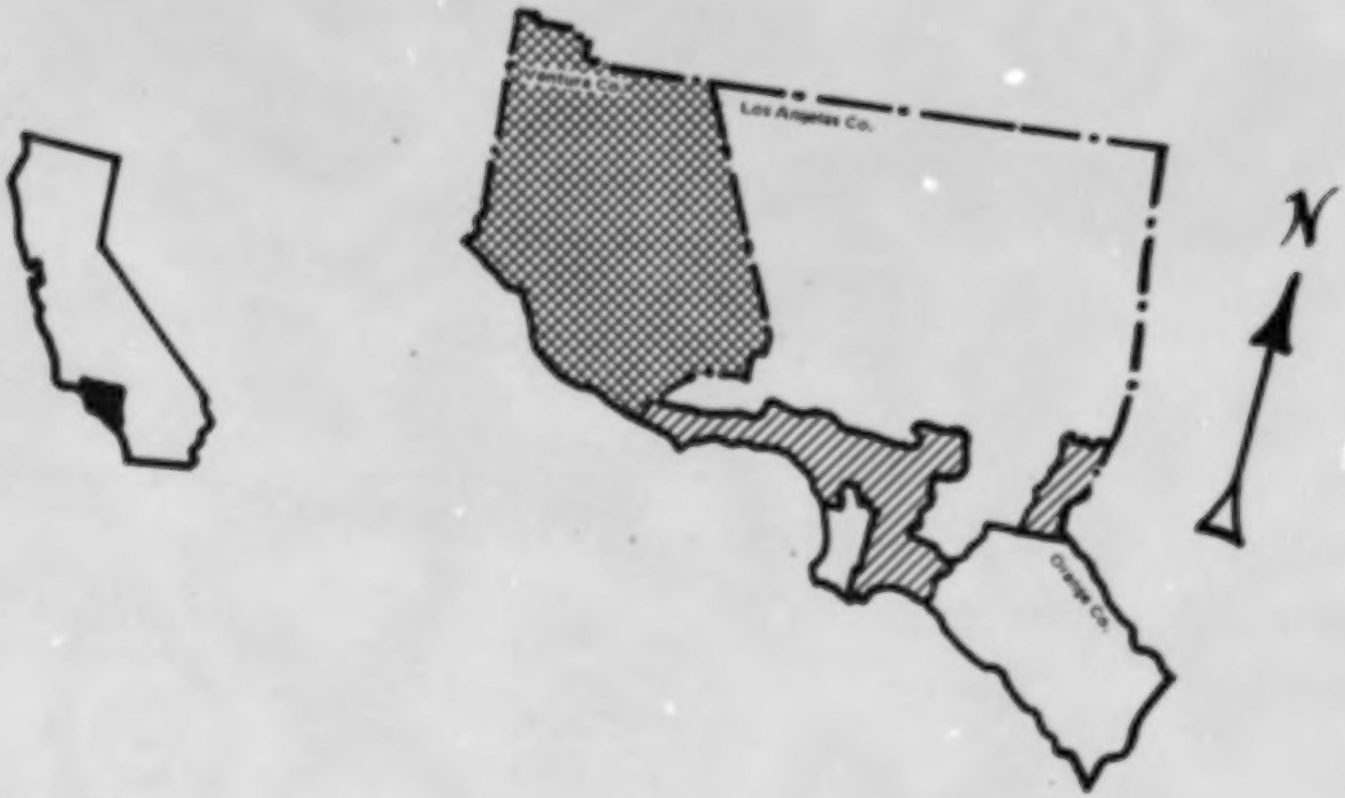
MAP 22


San Luis Obispo Co.
Kern Co.
Santa Barbara Co.
N
▨ Primary Care Physician Critical Shortage Areas

MAP 23


N
▨ Primary Care Physician Underserved Areas

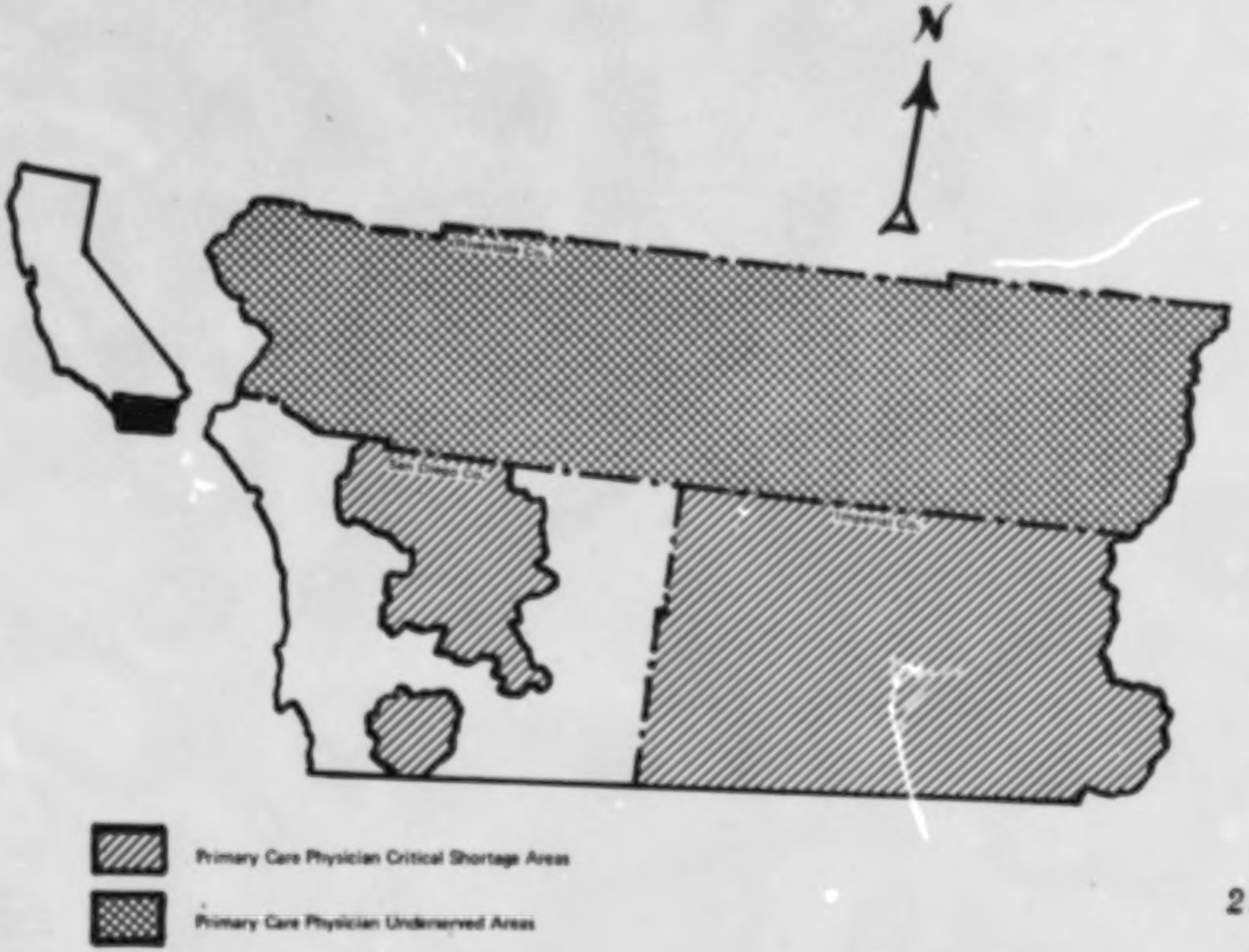
MAP 24

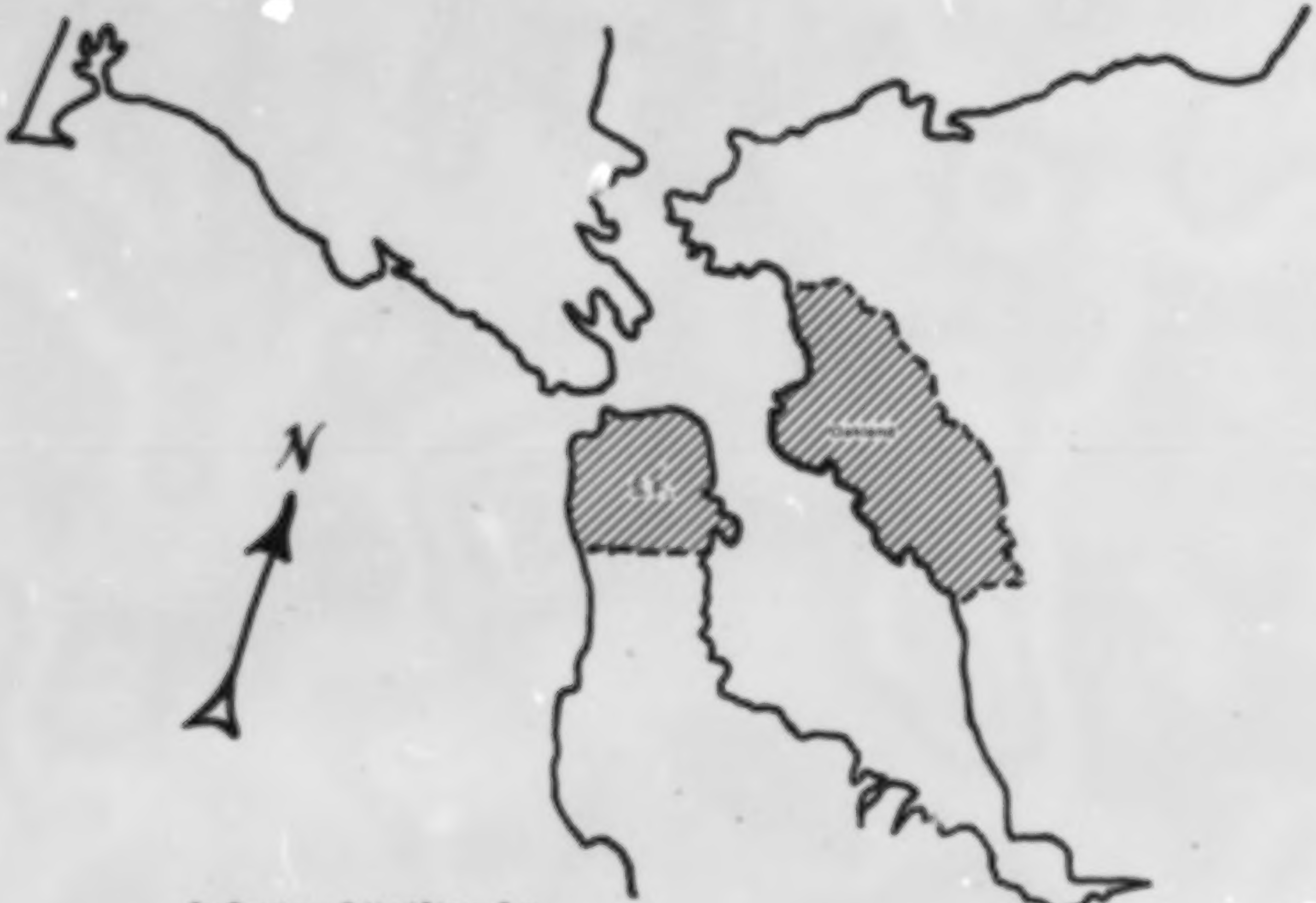

Ventura Co.
Los Angeles Co.
Orange Co.
N

▨ Primary Care Physician Critical Shortage Areas – See Detail Map

▦ Primary Care Physician Underserved Areas

MAP 25


N
Riverside Co.
San Diego Co.
Imperial Co.
▨ Primary Care Physician Critical Shortage Areas
▩ Primary Care Physician Underserved Areas


N
S.F.
Oakland

San Francisco – Oakland Primary Care

▨ Physician Shortage Areas

See Detail Maps I, II

4. PROBLEMS OF GEOGRAPHIC AND SPECIALTY MALDISTRIBUTION AND THE IMPORTANCE OF RESIDENCY TRAINING ON FUTURE PATTERNS

To deal with the current physician manpower problems in California, which include a relative shortage of primary care physicians, a relative shortage of physicians in some rural and low income urban areas, and an oversupply of physicians performing surgery, will require changes in federal health manpower policies--policies of the Coordinating Council on Medical Education, the Liaison Committee on Graduate Medical Education and the various specialty boards and societies involved in residency training, as well as health manpower policies in California. In terms of manpower policies, the number and didtribution of residency training postions is the key to future supply. Reimbursement policies under private health insurance, Medicare and Medicaid are also important.

In recent years the focus of federal and state health manpower policies related to physicians has begun to shift from concern with aggregate numbers, financial stability of medical schools and equal educational opportunity to geographic and specialty maldistribution and foreign medical graduates. Several factors have placed California in a more favorable position than the remainder of the country with respect to these problems. First, the strict requirements for medical licensure have limited the number of foreign medical graduates in the State. Second, California has attracted physicians in large numbers from all over the country, giving it one of the highest physician to population ratios in the country. Finally, the decision during the 1960's to locate new medical schools at U.C. Davis and U.C. San Diego and to transfer the California College of Medicine to U.C. Irvine has created a geographically well distributed network of public and private medical schools within the State. This system has the potential to improve the geographic distribution of residency training positions, to facilitate the recruitment of physicians to the area and to develop regional systmes of medical care, particularly for high cost, hosptial-based services.

The problems of geographic and specialty maldistribution are interrelated for several reasons, including the differing practice location preferences of internists and other specialists as compared to general and family practitioners, the significant variance in the number of patients see per day and per week by general practitioners and other primary care specialists, the declining number of general practitioners and the increasing number of internists and pediatricians who will be providing primary care in the future.

In this chapter we examine these issues from a national perspective, then analyze them in relation to California and, finally, discuss the possible impact of federal health manpower legislation on California's physician supply. We will dicuss the following:

-what is the problem

-the optimum distribution among specialists

-primary care and primary care specialists

-physician specialization in California

-specialization and physician location

-specialization, demand and utilization

-residency training programs in California

-the control of residency training

-choosing sites for training

-the impact of federal health manpower legislation

What is the problem?

Health manpower problems have been described in a variety of ways. The problem that we believe is central to improving access to medical care is the imbalance of primary care physicians and the variety of surgical and medical subspecialists.

In attempting to determine the need for particular specialists, such as primary care physicians, a variety of approaches have been developed. The models most generally utilized are discussed in greater detail in our earlier chapter on National Health Insurance. Briefly, they are:

-approaches based on professionally defined criteria;

-methods based on current utilization of services by a defined population group with access to comprehensive health services, as exemplified by prepaid group practice health care plans;

-techniques using physician/population ratios; and

-economic methods, including econometric modeling.

Examination of the basic data reveals a marked increase in the number of specialists and their ratio to the population in the past 40 years. At the same time, there has been a steady decline in both the number of general practitioners and their ratio to population. Although the total number of primary care physicians is approximately the same as in 1931, the ratio of primary care physicians to population has dropped sharply.

Primary care is general medical care that provides entry into the health care system, continuing care for common problems, both acute and chronic, as well as coordination of services when other specialists are required for diagnosis, treatment and rehabilitation.

Primary care is the foundation of the health care system, which also includes secondary and tertiary levels. Secondary care is specialist or subspecialist care provided in physicians' offices, hospital outpatient clinics or community hospitals. Tertiary care is provided largely in university medical centers or teaching hospitals by specialists and/or subspecialists or teams of associates often using complex equipment.

The Optimum Distribution of Physicians Among Specialties

a) What is specialization?

There is no one method available for determining the optimum distribution of physicians among specialties. There are, however, a number of factors that should be considered in establishing health manpower policy at the state or federal level. First, it is necessary to have an understanding of what is meant by specialization, how it is designated, and what the specialist does.

Specialization in medical care usually refers to the concentration of a physician's learning and practice on a particular type of illness (allergy and infectious desease, Psychiatry), a particular part of the body (Ophthalmology, Urology), a limited age group (Pediatrics, Geriatrics), or a specific set of services (Anesthesiology). Today, specialization occurs through a specified amount of training of the physicians, usually for a minimum of three years after graduation from medical school, in hospital-based residency training programs. However, much specialization in the past evolved as the generalist physician took a limited amount of post medical school training, but less than that required for specialty board certification, and then concentrated his area of practice. He was further able to develop his specialty focus through continuing education programs. There is little precision in the definition of specialization either for statistical and planning purposes or for the information needs of consumers. Many physicians, when surveyed by the American Medical Association, indicate that they provide services which can be categorized under several specialties; and many specialists and subspecialists provide primary care. The published compilations of the distribution of physicians among specialties refer only to the physician's principal specialty so that the actual distribution of effort may differ considerably from that protrayed in the available data.

In addition to the AMA surveys which rely on self-denotation, there are a number of institutional arrangements which provide information on the extent of specialization. There were 160,509 physicians certified by one or more specialty boards as of December 31, 1973. Board certification indicates that a physician has completed a residency program of specified length, has passed the examinations required by the relevant board, and has satisfied the practice experience requirements of the boards. In recent years, the specialty boards have attempted to clarify the difference in their certification from that of licensure. According to the Approved Directory of Internships and Residencies, "The boards are in no sense educational institutions, and the certificate of a board is not to be considered a degree. It does not confer on any person legal qualifications, privileges, nor a license to practice medicine or a specialty. The boards do not in any way interfer with or limit the professional activities of a licensed physician, nor do they desire to interfer in the regular or legitimate duties of any practitioners of medicine."(18) This is an apparent change from the earlier approach of the boards when in 1940 five boards specified that 100% of the applicants' practice should be devoted to the specialty, as defined by the board, and three boards demanded at least 70% concentration.(19) In 1973, the proportion of self-defined specialists who were board certified varied from 44% in internal medicine to 89% in otolaryngology.(20)

Physicians who have satisfied varying requirements by the different boards to be eligible to take their examinations are specified to be "board eligible." However, as one board has indicated in a recent Directory of Approved Internships and Residencies, "The Board decries the usage of the term either by the candidate or any organization in such a way as to imply that having received notification that he has been accepted for examination, the candidate is now possessed of some special qualification which is more or less equivalent to certification."(21)

The confusion in the meaning of specialization might be best illustrated by a particular example. A survey of psychiatrists was carried out by the American Psychiatric Association and the National Institute of Mental Health in 1965.(22) The basic survey population was all physicians who had reported to the American Medical Association that their primary specialization was in psychiatry, child psychiatry, or neurology. Of the 12,153 respondents (excluding trainees) who had reported that they worked one or more hours per day providing direct psychiatric services, 75.1% reported 3 years or more of residency training in psychiatry, 21.6% reported less than 3 years of residency training, and 3.4% failed to respond to the relevant question. Thirty-nine percent of the respondents were certified by the American Board of Psychiatry and Neurology and 72.5% were members of the American Psychiatric Association. It should be noted that 8.9% of all respondents who defined themselves as psychiatrists reported that they had no residency training in psychiatry.

As indicated earlier, physicians in a particular specialty have greater training and often more experience in providing certain defined services than specialists in other fields and general practitioners. They also are likely to have superior knowledge of potential treatments and their effects. The optimum distribution of physicians among specialties (including general or family practice) will depend on the mix of illness among the population served, the relative success of various specialists in treatment of those illnesses, the relative negative impact of the illnesses, and the costs involved in the additional training of specialists. Of course, the ability of patients to find the proper specialist for their needs under different aggregate mixes must be taken into account.

According to this framework, the frequent assertions that there is a maldistribution of physicians among specialties would imply that:

A) Services are being performed by physicians in a specialty which provides no benefits to patients, and may actually harm them; excess surgery falls into this category.

B) Services are being performed in one specialty which are less productive in some sense than those produced by physicians in another specialty. The suggestions that there should be relatively more primary care physicians are based on this concept.

C) Services are being performed by physicians in one specialty which could be performed as well by a physician in another specialty which requires less training. The case of general surgeons performing primary care would be placed here.

D) Services provided by a physician with additional training may be superior but not worth the costs of his training in terms of his output and demands on the time of teaching faculty.

Criterion B, C, and D are difficult to apply to actual situations because of the inadequate procedures available to measure outcomes from medical services. There is some evidence that criterion A does apply to some extent and the efforts of tissue committees and utilization review committees are attempts to alleviate the distortions which follow from it.

b) The distribution among specialties

One method that might be used to determine the distribution of physicians among specialties is to examine the effect of permitting all prospective practitioners to get training in the specialty of their preference. This is the case in the United States today except for rare situations, like that in Ophthalmology, where residency positions are tightly restricted by the profession. Taking account of the non-pecuniary aspects of each specialty, the personal attitudes of the physicians, and the variation in the length of training, physicians would choose according to the relative expected incomes. The question which then arises is to what extent incomes reflect the relative desirability of different specialties from the standpoint of physicians or the need from the standpoint of society. Data from the most recent AMA survey indicates that surgeons earned $58,774 in 1973 compared to net incomes of $42,336, $40,027, and $40,337 in general practice, psychiatry, and pediatrics, respectively.(23)

If the relative levels of income and changes in relative income are indications of relative value of services, an increase in the number of physicians would be desirable. However, the validity of that relationship must be questioned. To start with, there is generally a longer period of training required of surgeons. More surgical than medical services are covered by private health insurance. In many areas of the country surgeons perform relatively few operations in relation to their capacity, indicating an oversupply. Of even greater import, there is little reason to believe that consumers have an accurate perception of the value of different physician services in improving their condition. To a large extent the patient must depend on the advice of physicians which provides the physicain with considerable potential to control the demand for their services. It appears that skills which seem to be of considerable difficulty to acquire and which are used in situations where patients seem to be faced with considerable risks, will tend to be relatively highly valued even though other services may have greater impact on the patient's health.

Other procedures for determining the distribution of specialties are available for planning purposes. One procedure is to use the experience of large group practices which are responsible for providing care to given populations. To the extent that these groups have an incentive to provide good quality care in an efficient manner, one would expect them to use an efficient distribution of specialists. However, they are faced with relative income patterns of physicians determined outside their system, the relative shortages of the overall system for physicians in certain specialties, and physicians trained in the general patterns of care. Morever, the prepaid group practices which are usually used for comparisions have memberships which vary in demographic and socioeconomic characteristics from that of the general population and they do not have certain specialists on their staffs but purchase their services when needed.

Nevertheless, information from prepaid group practices do provide a baseline for comparison. The distribution of physicians in six major prepayment groups with analogous physician to population ratios for individual states was recently reviewed by Mason.(20) The prepaid groups included the relatively small Puget Sound and Group Health Association programs, several of the Kaiser Permanente regional groups, and the HIP program of affiliated groups. Each of the sample groups had one internist or family practitioner for between each 2,000 and 3,000 enrollees in the prepaid practice. For the whole country there was one for each 2,100 population. The plans generally had greater physician/population ratios for dermatologists, obstetricians and gynecologists, and pediatricians than the median state ratio. They had a lower ratio for general surgery, ophthalmology, psychiatry, and radiology. Similar ratios were found for anesthesiologists, orthopedists and otolaryngologists.

Another method that has been used to determine needs in different specialties is to ask for the expert opinion of specialties in special fields.(24) A more sophisticated approach has recently been taken by the American College of Surgeons and the American Surgical Association.(25) They have carried out a thorough study of surgical services in the United States in an attempt to determine future surgical manpower requirements.

A variety of studies indicate that although an ideal or optimal mix of specialists cannot be determined, it is fair to state that there is a growing shortage of physicians trained to provide primary care. To correct this problem the American Medical Association, the Coordinating Council on Medical Education and other groups have recommended that at least 50% of all residency training positions be in primary care.

Primary Care and Primary Care Specialists

Any attempt to determine the existing number of primary care physicians or to project future physician supply and requirements is complicated by the fact that most physicians in private practive are providing some primary care services. The recent National Ambulatory Medical Care Survey revealed that 40.4% of all office visits were made to general practitioners, 26.3% to medical specialists, 28.5% to surgical specialists, and 4.9% to all other specialists.(26) As recently as 1969, almost 60% of physian visits (other than those by physicians to hospital inpatients) were to general practitioners and less than 20% were to internists, pediatricians and other medical specialists. Although the increased demand for specialists accounts for part of the displacement of general practitioners by specialists, in some areas it is also related to the relative scarcity of primary care physicians, particularly general and family practitioners. These areas may have a relative oversupply of surgeons and other non-primary care specialists who often provide some primary care services.

A survey published by Medical Economics of physicians in ten specialties revealed that three-fifths of those wurveyed were doing some procedures outside of their field. Seventy-five percent of the specialists in rural areas were providing primary care. Perhaps the most interesting findings of the survey were the reasons why certain groups of specialists chose to provide primary care. While some physicians felt it was essential to maintaining their ability and stature as "complete" physicians, others were motivated more by economic factors. Young specialists who are not yet fully established supplement their practices with primary care. Older specialists who are phasing down their practices subsititute primary care for some more demanding procedures. Physicians in oversupplied specialties often expand the primary care component of their practices. Faced with the threat of malpractice, some specialists prefer providing primary care to performing high risk procedures.

Although these specialists may be meeting some primary care needs, this informal system of primary care should not be perpetuated. The focus of specialty training is inappropriate for primary care; and primary care by specialists raises the cost of services to the consumer.

The term "primary care physician" still creates a significant amount of confusion and therefore must be clearly defined. Often, "primary care physicians" is equated with family practitioner. Primary care is not, however, exclusive to the training and skills of the family physician. Legislation to encourage the training of primary care physicians should limit its definition to general internal medicine, general pediatrics and family practice. It is often suggested that obstetrics and gynecology be included in the definition of primary care. Many obstetrician-gynecologists are providing excellent primary care to their patients. The central focus of their training, however, is maternity care and surgical experience rather than primary care. Considered within the context of a general framework for good primary care training, obstetrics-gynecology and other specialties which are sometimes identified as primary care do not meet the requirements.

Physician Specialization in California

At the present time 44% of all active, U.S. non-federal physicians are in the primary care specialties of family practice, general practice, pediatrics and internal medicine. In California, in December 1975, 36.0% of all active non-federal physicians were in these primary care specialties.

The steady decline in the number of general practitioners during the past 40 years, without a commensurate rise in other primary care specialists has resulted in the current low ratio of primary care physicians to population. Between 1931 and 1973, the number of general practitioners and family practitioners declined from 112,000 to 58,000. In relation to population they declined from 90 general practitioners per 100,000 population in 1931 to 27.9 per 100,000 in 1973. The increase in pediatricians and internists in the same period raised the number of primary care physicians in their specialties and in family and general practice to 115,000, or 55.2/100,000 population in 1973. (See Table IV-19.)

TABLE IV-19. NUMBER OF PRIMARY CARE PHYSICIANS IN THE U.S.

Year	General Practitioners & Family Practitioners		General Practitioners Plus Other Primary Care Specialists*	
	Number	MD/Population Ratio	Number	MD/Population Ratio
1931	112,000	90/100,000	117,000	94/100,000
1973	58,000	27.9/100,000	115,000	55.2/100,000

* Internal medicine and pediatrics

Sources: Overpeck, Mary; Physicians in Family Practice 1931-67; Public Health Reports 85:485; June 1970.

National Academy of Sciences/Institute of Medicine; Social Security Studies, Interim Report: Medicare-Medicaid Reimbursement Policies: Effects on Teaching Hospitals, Physician Distribution and Foreign Medical Graduates: Washington, D.C.; National Academy of Sciences; March 1967; p. 57.

Although the total number of physicians in the United States increased by 90,000 (33% between 1963 and 1973) the number of primary care physicians increased by only 10,000 (8%). Whereas primary physicians constituted 46% of all physicians in 1963, by 1973 they constituted only 38% of the total. A similar trend has occurred in California. Between December 1964 and December 1971, the number of active non-federal physicians increased by almost 7,000 from 29,144 to 36,016 while the number of primary care physicians increased about 400 from 13,491 to 13,880. The result was that the percent of active non-federal physicians in primary care specialties in California declined from 46.3% to 38.5% during this period.(17) The decline in the relative percentage of primary care physicians continued through 1973. In spite of this relative decline California had one primary care physician (excluding subspecialtists) for each 1,516 persons in the State in 1973, or 66 primary care physicians per 100,000 population. California had 7,193 persons per general surgeon; 7,995 persons per psychiatrist; 14,175 persons per orthopedic surgeon; and 58,625 persons per neurosurgeon. In all of these fields, as well as most others, California ranked among the top states with respect to physician to population ratios.(2)

California had 9.7% of the United States population in 1973 but 12.6% of the patient care physicians were located there. The ratio of patient care physicians (includes office based practitioners, interns and residents as well as hospital based practitioners not engaged primarily in research, teaching or administration) to 100,000 population was 168 for California and 130 for the total United States. Nevertheless, within the State there is considerable variation in the availability of both primary care and specialist services and the question persists as to whether the specialty distribution is otpimal, given the aggregate number of physicians.

A study by the California Medical Association, several years ago, used several methods to estimate the adequacy of physician supply by specialty and concluded that the overall supply of physicians was adequate, the supply of most specialists was more than adequate, but the ratio of primary care physicians to population was probably below the optimal level.(17)
The report concluded:

> Both nationally and in California emphasis is appropriately being placed on augmenting the supply of primary care physicians, since available measures show that the current distribution between these two basic types is in reverse of what objective criteria call for.(27)

We have estimated the supply of physicians by specialty for California for 1980 and 1990, using national data and assuming that California will continue to attract physicians as it has in the past and also assuming that the patterns of specialty distribution in California will continue to closely resemble the national patterns. (4) The calculations are based on recently revised supply projections by the Department of Health, Education, and Welfare. The revised projection was based on the recent changes in residency training with increased numbers in family practice, internal medicine, and pediatrics. The revised projections increase the number of family practitioners by 3,700 in 1980 and 8,180 by 1990, while the number of internists is increased by approximately 1,200 by 1990 and the number of pediatricians by almost 2,400. The revisions in the DHEW projections illustrate how sensitive these are to changes in residency training policies. Our projections are based on these most recent DHEW projections but are equally subject to change with changes in residency training.

Our projections for primary care specialists, California was as follows:

	1970	1980	1990
General Practice	7,314	5,611	4,346
Family Practice	220	784	1,503
Internal Medicine	5,024	6,785	10,122
Pediatrics	2,238	3,202	4,764

Figures recently made available by the American Medical Association illustrate why projections made at this time must be considered very tentative. According to the AMA the percentage of U.S. medical school graduates choosing a first year position (internship or first year residency) in approved and matched primary care training programs in 1968 was less than 40%. By 1973 the percentage had risen to more than 50% and in 1975 it was 62%. The approved and matched positions represent 85-90% of all first year positions. If these increases are sustained, our projections will be low.

Specialization and Physician Location

Specialization complicates the problem of geographic maldistribution because specialists and subspecialists tend to settle in areas of large population concentrations. This tendency is reasonable, since these physicians need to serve a considerably larger population than that of the primary care physician if their services are to be utilized effectively. It has been observed in studies of both geogrphic and specialty maldistribution that communities seeking physicians are often seeking a primary care physician while physicians seeking practice locations are usually specialists.

To retain access to sophisticated services and consultant opportunitieis, specialists are attracted to areas near medical schools, teaching hospitals or large, well-equipped and well-staffed community hospitals. General practitioners and family practitioners are more attracted to towns of 1,000 to 10,000 population than are internists, pediatricians, or other physicians providing primary care services. (17) The tendency for general practitioners to have a relatively heavier distribution in areas with smaller populations has long existed. (See Table III-2 & 3, pg. 136). The patterns of the 1950's and even earlier periods are still evident in in the 1970's.

A study by Paiva and Haley in 1971 (28) and a recent report from the University of Missouri, indicated that medical students who intended to become general practitioners were more likely to have come from towns with less than 10,000 population or from rural areas than were those seeking a specialty. Data on physicians in California reveals the inclination for internists and pediatricians to settle in metropolitan areas. In contrast, California's general practitioners are more evenly distributed in relation to the state's population.

TABLE IV-20

NUMBER OF ACTIVE NONFEDERAL PHYSICIANS, TOTAL POPULATION AND PHYSICIAN/POPULATION RATIOS BY TYPE OF AREA, CALIFORNIA DECEMBER 1963 AND DECEMBER 1971

Type of Area[1]	December 1963			December 1971			Percent Increase	
	Physicians	Population (000)	Ratio	Physician	Population (000)	Ratio	in physician	in ratio
Major Metropolitan	23,182	13,428.6	172.6	29,920	15,379.1	194.5	29.1%	12.7%
Other Metropolitan	3,561	2,983.1	119.4	4,803	3,504.3	137.1	34.9	14.8
Counties Adjacent to Metropolitan Areas	666	693.2	96.1	819	786.7	104.1	23.0	8.3
Isolated Semi-Rural	591	564.8	104.6	686	609.6	112.5	16.1	7.6
Isolated Rural	73	99.8	73.1	101	114.5	88.2	38.4	20.7
State Total	28,073	17,769.5	158.0	36,329	20,394.2	178.1	29.4	12.7

[1] Counties included in each classification:

Major Metropolitan: Alameda, Contra Costa, Los Angeles, Marin, Orange, San Diego, San Francisco, San Mateo, Riverside, San Bernardino, Santa Clara.

Other Metropolitan: Fresno, Kern, Sacramento, San Joaquin, Santa Barbara, Monterey, Napa, Placer, Solano, Sonoma, Stanislaus, Ventura, Yolo.

Adjacent: Amador, Calaveras, El Dorado, Kings, Madera, Merced, San Benito, San Luis Obispo, Santa CRuz, Sutter, Tulare

Isolated Semi-rural: Butte, Colusa, Glenn,Humboldt, Imperial, Mendocino, Nevada, Shasta, Siskiyou, Tehama, Tuolumne, Yuba.

Isolated Rural: Del Norte, Inyo, Lassen, Modoc, Alpine, Lake, Mariposa, Mono, Plumas, Sierra, Trinity.

SOURCE: Division of Socio-Economics & Research; Bureau of Research Planning; California Medical Assoc.; Socio-Economic Report Vol. XIII, No.2; February 1973; p.3.

The maldistribution of specialists in California is part of the broader problem of the geographic maldistribution of all physicians. The ratio of active non-federal physicians in California ranged from a high of 565.3 physicians per 100,000 population in San Francisco County to a low of 38.0 in Modoc County in 1975. The statewide ratio was 203.8 active non-federal physicians per 100,000 population.

The increased number of physicians moving to California and graduating from its medical schools between 1963 and 1975 resulted in substantial improvement in the availability of physicians in all areas of the state, from major metropolitan to isolated rural areas. (See Table IV-20).

TABLE IV-21

ANTICIPATED NATIONAL HEALTH SERVICES CORPS SITES IN CALIFORNIA FOR FISCAL YEAR 1976/1977

Site	County
Livingston	Merced
Etna	Siskiyou
Downieville	Sierra
Cueneville	Sonoma
Banning	Riverside
Bishop	Inyo
Browns Valley	Yuba
Orland	Glenn
Vacaville	Solano
Trinidad	Humboldt
Hollister	San Benito
Dixon	Solano
Lamont	Kern
Lucerne Valley	San Bernardino
Soledad	Monterey
Rio Linda	Sacramento
Baker	San Bernardino
San Joaquin	Fresno
Needles	San Bernardino

California cities and counties that are anticipated sites for the National Health Service Corps in 1976 include a number of small towns in these short supply areas. (See Table IV-21). All of the physicians who will be assigned will be in primary care specialties.

Preliminary data based on telephone interviews of physicians office staff in 1973, 1974, and 1975, provided by Dr. Philip Held of Mathematica, indicate that new patients wishing to see a physician have the longest waits in the Sacramento, Fresno and Bakersfield standard metropolitan statistical areas, while the shortest waits were in San Diego, Oxnard, Anaheim, San Bernadino-Riverside and Los Angeles. Despite relatively low physician to population ratios in some of these areas (e.g. Anaheim, San Bernadino-Riverside, Oxnard) the productivity of the physicians were such that they were able to handle the patients without delay. A similar pattern was also found for the waits by established patients. It is clear that the capacity of physicians to meet the demands of patients is greater than that which had been estimated in the past and that which is not always related to physician - population ratios. One factor appears to be the total number of general practitioners or family practitioners and their importance as primary care providers.

TABLE IV-22

AVERAGE NUMBER OF OFFICE VISITS PER WEEK BY SPECIALTY AND LOCATION—1973

Specialty	Total	Location Non-Metropolitan	Metropolitan 50,000-999,999	Metropolitan 1,000,000+
Total	97.9	127.5	102.7	84.2
General Practice	145.5	162.8	149.3	125.4
Internal Medicine	79.4	90.0	87.5	73.0
Surgery	81.1	91.5	85.5	74.0
Obstetrics and Gynecology	98.4	109.5	106.1	90.8
Pediatrics	134.9	151.3	149.9	121.9
Psychiatry	36.3	29.0	40.6	35.0
Radiology	92.6	84.1	107.0	81.5
Anesthesiology	7.5	18.8	11.1	1.5
Other	95.4	92.5	102.2	91.6

SOURCE: American Medical Association; Center for Health Services Research and Development; Profile of Medical Practice '74; Chicago; American Medical Association; 1974; p. 183.

Specialization, Demand and Utilization

The increased demand for specialty services is a major factor in the decline in the number of general practitioners during the past forty years. Urban and suburban residents, particularly individuals in the higher socio-economic groups, have sought the care of specialists. As stated earlier, a recent National Ambulatory Medical Care Survey indicated that 26.3% of all office visits were made to medical specialists, 28.5% to surgical specialists, including obstetricians and gynecologists, and 4.9% to all other specialists.(26) It appears that the increased demand for specialists as well as the relative scarcity of primary care physicians in some areas, explains in part, the displacement of general practitioners by specialists.

It is difficult without more definitive data to assess the impact of a shift in the provision of primary care from general practitioners to internists. General practitioners and internists often have a different style of practice and, even in similar settings, general practitioners see many more patients per week and per year than do internists. (See Tab. IV-22). This greater patient load may reflect a larger percentage of infants and children in the general practitioner's practice. It certainly reflects fewer hospitalized patients and probably few ambulatory patients with complex medical problems. A future shift from general practitioners to internists might increase the projected primary care physician requirements substantially or it might lead to the increased use of physician assistants and nurse practitioners working with internists and pediatricians. These developments might also accelerate the decline in solo practice and the growth of group practice.

TABLE IV-23

ORIGIN OF INTERNS AND RESIDENTS IN CALIFORNIA: 1974

ORIGIN	INTERNS	RESIDENTS	TOTAL	%
California M.D. Graduates	402	1,348	1,750	27.9%
Other U.S. M.D. Graduates	903	3,216	4,119	65.6%
Canada M.D. Graduates	22	63	85	1.3%
Foreign M.D. Graduates	50	276	326	5.2%
TOTALS	1,377	4,903	6,280	100.0%

SOURCE: AMA Department of Undergraduate Medical Education and the AAMC Division of Operational Studies, "Undergraduate Medical Education", _JAMA_, 234: 1,358, December 29, 1975

d. Residency Training: As of December 1974 there were 41,038 U.S. medical graduates serving as interns or residents. Of these, 15,958 or 41% remained in the same state in which they received their medical education. California at that time retained approximately 44% of its M.D. graduates for graduate training, Indiana retained 52%, New York 49%, and Texas 55%. Overall, in December 1974 California was training a total of 6,280 interns and residents, which represented 10.5% of the United States total. A breakdown of the resident origin of these interns and residents is provided in Table

An analysis of Table IV-23 clearly shows that, although California retains approximately 44% of its M.D. graduates for internship or residency training only 27.9% of the training slots in this state are occupied by Californians. That is to say, two-thirds of all the residency and internship training positions in the state of California are occupied by out-of-state students, Canadians or foreign medical graduates.

TABLE IV-24

BREAKDOWN OF CALIFORNIA PRIMARY CARE RESIDENCIES OFFERED BY SPECIALTIES COMPARISON 1973-1975

	1973 Residents	Percent of Primary Care: Total	1975 Positions Offered	Percent of Primary Care: Total	Differential*	Percent Differential
FP	198	14	332	15	134	68
IM	854	64	1302	61	448	52
PD	299	22	507	24	208	69
Totals	1351		2141		790	58

SOURCE: 1975 California data taken from AMA Directory of Approved Residencies for 1974-1975;

1973 California data taken from Distribution of Physicians in the U.S., 1973, American Medical Association (Chicago, 1974).

*Difference between positions offered in 1975 and Residents in 1973.

The primary care residencies offered in July 1975 were 790 greater than the number of residents in those specialties in December 1973. Information on the three primary care specialties reveals that the difference for family and general practice was 134, a 68% differential. The difference was 448 (52% for internal medicine amd 208 (69%) for pediatrics. (See Table IV-24.)

The importance of internal medicine as the most significant primary care specialty is evident on examination of the data in California, where internal medicine represents over 60% of the primary residents.

The rapid increase in the number of residents in training in primary care in California is also found nationally. (See Table IV-25.) The no. of U.S. and Canadian graduates entering primary care residency training more than doubled between 1968 and 1974, from 2,568 to 5,990, as did the total number of primary care residents (from 3,845 to 7,765).

The eight years from 1960 to 1968 saw only a relatively small increase in primary specialties. First year positions in internal medicine increased from 2,193 to 2,589 and those in pediatrics increased from 895 to 1,098, while the number in general practice declined from 364 to 256.(21) The total gain was only 493 compared to the gain of 3,922 between 1968 and 1974.

In contrast to the rapid increase in the number of first year positions in primary care specialties since 1968, first year positions in general surgery and other surgical specialties have increased from 4,005 to only 4,852.(21)

The rapid change in the number of first year positions in primary care doesn't guarantee that the first year residents will, in fact, follow a career in primary care practice. Many will enter medical subspecialties,

TABLE IV - 25

CHANGES IN "PRIMARY CARE" RESIDENCY PROGRAMS AND FIRST-YEAR POSITIONS 1968-1974

Specialty	PROGRAMS			FIRST-YEAR POSITIONS FILLED											
	Number of Approved Programs			Total 1st Year Positions Filled			Number of U.S. & Canadian Graduates			Number of Foreign Medical Graduates			% of Foreign Medical Graduates		
	1968	1973	1974	1968	1973	1974	1968	1973	1974	1968	1973	1974	1968	1973	1974
Family Practice	-	206	232	-	766	1197	-	720	1124	-	46	73	-	6	6
General Practice	154	51	38	254	176	157	116	33	23	143	143	134	30	23	21
Internal Medicine	419	433	422	2589	4139	4571	1801	3154	3591	788	985	980	30	23	21
Pediatrics	260	274	262	1002	1699	1842	651	1141	1252	406	588	590	41	33	32
TOTALS	833	964	954	3845	6780	7767	2568	5048	5990	1337	1762	1777			

Source: Statement of the American Medical Association regarding Health Manpower Legislation 5989, 5991, 5996, S 1357, HR 5546, before the Sub-Committee on Health, Committee on Labor and Public Welfare, U.S. Senate.

while others will probably pursue careers in radiology, pathology, neurology and other fields.

In his earlier study of residency training Weber(61) observed that if the average physician practices 30 years, it would require 3.5 residents in training to replace every 100 physicians in a particular specialty. He found that in 1970, general surgery had 12.2 new trainees for each 100 physicians, while the combined primary care specialties of practice, internal medicine, and pediatrics had only 4.5 physicians in training for every 100 in practice. By 1973 the number of first year residents in surgery had declined to 8.7 for each 100 physicians in practice while there were 5.7 first year residents for every 100 physicians in family and general practice, internal medicine and pediatrics.

Although the rapid increase in the number of family practice residency positions has received much attention, it cannot begin to match the dominant role of internal medicine as the major primary care specialty. This becomes evident in both statistics on practicing physicians and physicians in training. It is true that the most significant increase in the number of primary care residencies during the past few years was in family practice. The number grew from 131 filled first year positions in 1970 to 766 filled first year positions in 1973 to over 1,450 first year positions offered for 1975-76. The total number of family practice and general practice residencies offered in 1975-76 was 3,305. Although the growth has been rapid, these figures still represent less than 5% of total available residency positions. It is too early to predict the long term impact of this rapid growth in family practice residencies or whether it will continue.

Most family practice residency programs are located in university affiliated hospitals, while only a few have been established in university medical centers. A critical factor in developing a family practice program is the recruitment of family practice faculty of equal caliber to their colleagues in other primary care specialties. Reliance upon physicians currently in residency training to accept family practice faculty positions is a long term endeavor which cannot meet the immediate demand. Practicing family physicians and general practitioners have been moving into faculty positions in recent years. The ability of family practice programs to continue to recruit faculty at a rate which will allow further rapid expansion of positions is questionable.

In addition to faculty recruitment problems faced by family practice training programs, a number of curriculum and administrative issues await resolution. For example, will departments or divisions of family practice have full responsibility for inpatient care of selected patients? How much of the training will be conducted in other departments, such as pediatrics, obstetrics and gynecology and surgery? While these programs will undoubtedly continue to develop, there is little likelihood that a rapid expansion of family practice residencies would fill the gap in primary care created by the decline in general practice.

Family practice programs must develop in concert with programs in the other primary care specialties if the goal of having 50% of graduate. medical students become primary care specialists is to be achieved. This point becomes even more obvious when one considers that training positions in internal medicine represent nearly 60% of all first year and total primary care training positions, followed by pediatrics (26%) and general and family practice (14%). Even if obstetrics and gynecology is added to the list of primary care specialties, it does not significantly modify the role of internal medicine as the dominant primary care specialty.

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TABLE IV-26

NUMBER OF ACTIVE PHYSICIANS (M.D.) ENGAGED IN PRIMARY CARE: ACTUAL 1963 AND 1970; PROJECTED 1980 AND 1990

Activity and specialty	Number of physicians (M.D.)				Percent distribution			
	1963[1]	1970	1980	1990	1963	1970	1980	1990
Total active physicians	261,730	311,200	430,240	571,030	100.0	100.0	100.0	100.0
Physicians in primary care	125,530	137,520	178,140	226,150	48.0	44.2	41.2	39.3
General practice	66,870	56,260[1]	47,210	36,700	25.6	18.1	10.9	6.4
Family practice	N.A.	1,690	2,920	4,450	—	0.5	0.6	0.7
Internal medicine	30,430	41,870	71,020	105,620	11.6	13.5	16.5	18.4
Pediatrics[2]	12,930	18,820	31,140	45,410	4.9	6.0	7.2	7.9
Obstetrics and gynecology	15,300	18,880	25,850	33,970	5.9	6.1	6.0	5.9
Physicians in all other activities	136,200	173,680	252,100	344,880	52.0	55.8	58.8	60.7

[1] Excludes 1,690 diplomates in family practice who have been shown separately.

[2] Includes pediatric allergy and pediatric cardiology.

SOURCE: 1963--Theodore, C.N. and Sutter, G.E. "Distribution of Physicians in the U.S."; 1963. Chicago, American Medical Association, 1967.
1970: Haug J.N.: Roback, G.A.; and Martin, B.C. "Distribution of Physicians in the United States", 1970. Chicago, American Medical Association, 1971.

Reproduced from: U.S. Department of Health, Education, and Welfare; Bureau of HRA; "The Supply of Health Manpower: 1970 Profiles and Projections to 1990; Pub. No. (HRA) 75-38; Washington, D.C.; U.S. Government Printing Office; 1974; p. 67.

In 1973 the total number of general and family practitioners was about equal to the number of internists and pediatricians although a far higher percentage of the former group were in office-based practice. By 1980 the number of internists will far exceed the number of general and family practitioners and the number of pediatricians and internists together will be more than double the number of family and general practitioners. (See Table IV-26.)

Future projections of primary care specialists must be viewed with caution in view of the recent increase in the number of physicians choosing primary care specialties. In spite of the recent rapid increase there is still the need to increase the total number of primary care residency positions. To reach the desired level of 50% of residency positions in the primary care specialties of internal medicine, pediatrics and family practice would require increases in the second and third year of residency training comparable to the recent changes in first year positions. We have estimated that at least 5,000 additional positions would be required to achieve this goal. These positions will have to be established by new medical schools or in hospitals where training programs have not existed in the past. These increases will have to occur while the excess number of residency positions in the surgical specialties are eliminated. This will probably require another three to five years to accomplish. Changing the mix of available residencies would affect all medical school graduates equally, it would have a discernable impact on health care within five to ten years and it would only modestly limit the student's freedom to make his or her own career decision.

TABLE IV-27

RESIDENTS IN PRIMARY CARE SPECIALTIES, CALIFORNIA AND THE UNITED STATES--1973

(NON-FEDERAL PHYSICIANS)

	NATIONAL				CALIFORNIA		
	residents	percent of all residents	percent of primary care residents	California residents as a percentage of all U.S. residents	residents	percent of all residents	percent of primary care residents
TOTAL: ALL SPECIALTIES	42,351			7	3,843		
FAMILY PRACTICE/ GENERAL PRACTICE	1,708	4	12	9	198	5	15
INTERNAL MEDICINE	9,433	22	65	9	854	22	63
PEDIATRICS	3,260	8	23	7	297	8	22
PRIMARY CARE TOTAL	14,401	34	100		1,349	35	100

SOURCE: C.A. Raback, *Distribution of Physicians in the U.S., 1973*, (Chicago), American Medical Association., 1974)

In 1975 there were 2,141 residency positions offered in primary care in California. Fifteen percent of all patient care physicians in California in 1973 were interns and residents. They provided a significant amount of medical service to California citizens.(9) However, the distribution of these services was limited to a large extent to metropolitan areas where the majority of training programs are located.

There were a total of 3,843 residents in all specialties in California according to the AMA Distribution of Physicians for 1973. Thus California has 9% of the non-federal residents in the United States. (See Table IV-27). While the nation had 34% of all residents in the primary care specialties of family/general practice, general internal medicine, and pediatrics, California had 35% (1,349) in the fields of specialization. Nationally, 66% of all primary care residents were in internal medicine, while California had 61% in internal medicine. The smallest proportion of residents within primary care were in family or general practice--12% nationally and 15% in the State.

This percentage of primary care residents represents a trend that began in the late 1960's. Between 1968 and 1974 the total number of residents in primary care almost doubled in the U.S.; from 3,845 to 7,765.(10) California experienced a similar trend in primary care residency growth. For example, between 1973 and 1975 there was an increase of 790 primary care residencies in California. During that time family-general practice increased by 134 residency slots (68% increase), internal medicine by 448 (52% increase) and pediatrics 208 (69% increase.)(9)

TABLE IV-28

TABLE STATUS OF GRADUATE TRAINING PROGRAMS CALIFORNIA MEDICAL SCHOOLS 1975-76* AND PROPOSED 1976-77**

SCHOOL	TOTAL INTERN AND RESIDENT POSITIONS																			
	PRIMARY CARE																All other Interns & Residents***			
	Fam. Prac.				Int. Med.				Ped.				Ob. Gyn.							
	75-76		76-77		75-76		76-77		75-76		76-77		75-76		76-77		75-76		76-77	
	FY	LY	FY	LY	FY	LY	FY	LY	FY	LY	FY	LY	FY	LY	FY	LY	FY	LY	FY	LY
UCSF	22	25	25	25	43	40	50	45	21	22	24	25	9	10	12	12	76	152	92	162
UCLA	34	30	48	36	187	96	197	102	41	44	51	47	8	18	10	23	148	236	176	285
UCD	12	17	29	21	28	32	30	39	11	13	12	5	7	6	8	6	91	56	88	79
UCI	24	4	28	16	70	20	88	34	26	7	31	15	12	3	14	5	68	82	83	91
UCSD	6	0	6	4	24	17	25	22	11	6	9	11	4	3	3	3	47	51	51	46
USC	0	0	6	0	84	39	78	50	26	18	26	20	15	11	15	14	105	103	118	105
STANFORD	-	-	-	-	17	15	18	15	13	11	12	11	0	6	0	6	29	73	30	73
LOMA LINDA	9	5	12	9	26	17	25	20	10	5	5	13	6	4	5	6	16	36	18	35
C.R. DREW	0	0	4	1	14	10	14	10	10	8	12	8	6	6	6	3	20	26	26	23
TOTALS	107	81	158	112	493	286	525	337	169	134	182	159	67	67	73	78	500	815	682	899

Key: 1. FY = Interns or First Year Residents

2. LY = Residents completing their Last Year of training

Compiled from data submitted to the California Health Manpower Study Office by individual medical schools, Fall 75 and Spring 76.

*Intern and Resident Figures for 1975-76 include budgeted positions which are vacant.

**Intern and Resident Figures for 1976-77 include all proposed budgeted positions.

***This category includes the Medical and Surgical Specialties, Community Medicine, Pathology, Radiology, Psychiatry, Nuclear Medicine, and others not listed above.

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Table IV-28 provides an analysis of California's medical school's interns and resident positions for the current academic year 1975-76 and projections for the 1976-77 year. The data are broken down for each school by primary and "all other" intern-residents for the *first* and *last* years of training. This kind of analysis appears to be helpful since it gives some idea of numbers just entering training expressing interest in primary care as well as those who are completing their training. It should be noted that this data was difficult to obtain and that similar data should be collected annually in future years for academic planning purposes. The data presented do not include the intern and residency positions in hospitals not affiliated with a university medical school in the State.

TABLE IV-29

PERCENT* FIRST AND LAST YEAR PRIMARY CARE INTERN-RESIDENTS, CALIFORNIA MEDICAL SCHOOLS 1975-76 AND PROJECTED 1976-77

SCHOOL	FIRST YEAR 1975-76	FIRST YEAR 1976-77	LAST YEAR 1975-76	LAST YEAR 1976-77
UCSF	56	55	39	40
UCLA	65	63	44	42
UCD	39	47	55	49
UCSD	40	46	34	47
USC	54	51	40	44
UCI	66	66	29	43
Stanford	51	50	30	30
Loma Linda	76	72	46	58
Charles Drew	60	58	48	49
TOTALS	58 (56)	58 (56)	41 (36)	43 (38)

( )-% in primary care excluding intern-residents in OB-GYN.

*% of the total number of first or last year interns-residents being trained at each school who are enrolled in primary care specialties (Family Practice, Internal Medicine, Pediatrics, OB-GYN).

SOURCE: Compiled from data submitted to the California Health Manpower Study Office by individual medical schools, Fall 75 and Spring 76.

Table IV-29 is a summary analysis of the raw data in Table IV-28. It provides for each school the percent of the total first or last year intern-residents being trained in the primary care specialties. At the present time the nine medical schools have 36% of their last year residents in primary care training slots (or 41% if OB-GYN last year residents are included). In the next academic year (1976-77) it is projected that 38% of the last year residents will be in primary care (or 43% if OB-GYN residents are included). More significantly, the trend toward increased primary care training is evidenced by the percentage of first year training slots reserved for primary care intern-residents (58% for both 1975-76 and 1976-77 or 56% excluding OB-GYN).

This above analysis is significant insofar as the University of California medical schools have established the goal of 47% primary care residencies by 1979 (which they define to include Community Medicine, Family Practice, General Internal Medicine, Obstetrics and Gynecology, and General Pediatrics).(12) If USC, Loma Linda, and C.R. Drew intern-resident data are excluded from the analysis in Table IV-29. The University of California medical schools have 58% of their first year (1975-76 academic year) intern-residents in primary care training slots (Family Practice, Internal Medicine, Pediatrics, OB-GYN); or 57% if OB-GYN intern-residents are excluded.

It is expected however, that many of these students will later transfer to general internal medicine or sub-specialty trainings.

The CMA Socioeconomic Report in December 1975 published their 1975 survey of opinions of medical students and graduates reported that 75.4% of the class of 1978 and 69.7% of the class of 1975 indicate plans to practice a primary care specialty. "Presumably this trend may be attributed to the current focus on the need for more primary care physicians, now generally acknowledged within the medical schools and reflected in student curricula", commented by the editor of the Report.

The Control of Residency Training: The central issue in the debate on specialty maldistribution is whether desired changes in the total number and mix of residencies can be effected voluntarily, perhaps with additional financial incentives, or whether they will require the imposition of government regulation and control. Most professional groups, including the Coordinating Council on Medical Education, favor incentives and the voluntary approach. In its testimony before the Subcommittee on Health and the Environment, U.S. House of Representatives, the AMA presented data which, according to its interpretation, indicated that the relative shortage of physicians in primary care was correcting itself and that the geographic maldistribution of residencies was also improving with the establishment of new programs by over twenty new medical schools. The trends in specialty training during the pst forty years and the failure of present voluntary mechanisms to effectively control the total number of residencies or to create a balanced mix among training positions in primary care and other specialties is hardly a cause for optimism.

To understand the limitations of relying on a voluntary approach, one must be aware of the current system of governance in graduate medical education. The AMA Council on Medical Education has actively reviewed medical schools for accreditation for nearly 70 years. In 1942 it began to jointly share this reponsibility with the Association of American Medical Colleges through the establishment of the Liaison Committee on Medical Education. The AMA through its Council on Medical Education has also maintained an influential role in the accreditation of graduate medical education, although several other bodies are officially charged with accreditation authority. Internship programs traditionally have received accreditation from the AMA's Internship Review Committee. Review and accreditation of residency programs has been largely in the hands of the AMA, the specialty societies, and the American Hospital Association. In describing the residency review process, particularly its lack of coordination, the Committee on Goals and Priorities of the National Board of Medical Examiners notes:

> The Residency Review Committees regularly receive documentation of the program activities from program directors and periodically initiate site visits to review the adequacy of educational programs. Little coordination exists among the various Residency Review Committees, however, and required standards for the many residency programs vary from one committee to another.

The need for a more effective mechanism for relating undergraduate and graduate medical education has long been recognized. In January 1972, the American Medical Association (AMA), the Association of American Medical Colleges (AAMC), the American Board of Medical Specialties (ABMS), the American Hospital Association (AHA), and the Council of Medical Specialty Societies (CMSS) outlined a new organizational structure for coordinating the accrediting bodies of both undergraduate and graduate medical education. Accreditation of undergraduate medical education remains the responsibility of the Liaison Committee on Medical Education. The integration of the internship into the initial phase of residency training has led to many internships being approved by the Residency Review Committees since 1972. In 1975, all internships will be integrated into the first year of residency training. At the same time responsibility for accrediting graduate medical education will pass to the recently established Liaison Committee on Graduate Medical Education which will base its final actions on recommendations presented by the individual Residency

Review Committees. The Coordinating Council on Medical Education (CCME) is to provide the means of coordination between the two committees responsible for accreditation of undergraduate and graduate medical education.

The formation of the CCME represents an important step toward integration of medical education and accreditation. It is too early to evaluate, however, whether the CCME will be able to respond to such national priorities as correcting the relative shortages in primary care residency positions. Considering the medical school as part of the voluntary mechanism to control and redistribute residency positions will achieve minimal change. Even though the number of university affiliated residency programs has increased substantially, the medical school exerts little control over the mix of its training programs. Such decisions remain the province of department chairmen and the Residency Review Committees.

Accreditation of residency programs, while focusing on quality of education, has tended to follow a pattern which reflects the best interests of the individual specialties regardless of their relationship to national priorities. Clearly the present voluntary "market" system cannot be relied upon to achieve increased numbers of primary care physicians. More aggressive actions will be needed since it is now universally recognized that increasing the aggregate supply of physicians will not assure an appropriate distribution of specialists to meet the nation's primary health care needs in the most efficient or desirable manner.

Another method of achieving a more desirable specialty mix among physicians in residency training is the creation of a joint federal and professional regulatory mechanism at the national level. This mechanism would utilize organizations which have proven competence in evaluating the content and quality of graduate training programs. Moreover, its authority would be backed by the leverage of federal capitation support and reimbursement for services under Medicare and Medicaid which is necessary to guarantee implementation of its decisions.

To achieve the desired balance among specialties in residency training positions requires several concomitant actions. A first step is the reduction of the annual number of available first year residency positions to a defined percentage of U.S. medical gradutes. This number affords opportunities for students from abroad to participate in U.S. graduate medical education while not allowing the excessive numbers of positions which currently exist in various specialties. If the total number of residency positions is not controlled, the absolute number of residency positions in oversupplied specialties can continue to expand even with a requirement that 50 percent of all positions be in primary care.

The concern has often been expressed that restrictions in the total number of first year residency positions will mean the loss of essential positions in some hospitals, especially those located in urban poverty areas and those with high concentrations of foreign medical graduates. This, in fact, is not the case. Phasing in the reduction from the current 155% of U.S. medical greuates to 125% in 1980 shows 19,250 first year positions in 1980, based on an estimated 15,400 U.S. medical school graduates in 1980. In 1973, there were 18,076 first year positions available and the number is probably close to that today. The fact that 16,100-16,200 first year positions were offered in the nationwide matching plan, the matching positions usually represent 85-90% of all approved training positions. The maintenance of at least current numbers of residency positions is assured by the expanded enrollments of U.S. medical schools during the past five years, unless the economy takes a further significant downturn. Because of the economic problems in New York City and the likely closing of a number of teaching hospitals, the number of residencies available in New York will actually decline. No such trend is evident in California at the present time. Controlling the total number of available first year positions could in fact bring more U.S. medical graduates into positions which are now considered less desirable, since there will be fewer alternatives open to them.

Redistributing residency positions within the limited total number in order to establish 50% in primary care can be accomplished at two levels. The more quickly attainable goal is to establish 50% of all first year residencies in primary care at the national level. This could be achieved in a three year period. This approach does not guarantee, however, an even distribution of primary care residency positions among all schools. Moving from the national level to a requirement that each school, with its network of affiliates, have 50% of its residencies in primary care would call for a longer implementation period. For some schools, this stipulation presents no problem; but for others, where current primary care positions comprise perhaps 25% of the total, it represents a dramatic change. Such a transition might necessitate a minimum period of five years. We do not believe it likely that Congress will enact a proposal requiring each medical school to have 50% of its residents in primary care positions, but the proposal is currently under consideration in the U.S. Senate.

Requiring schools to increase the proportion of primary care training positions can indirectly improve the geographic distribution of physicians and training programs in the surrounding areas. In order to expand ambulatory care training capacities, many medical schools will have to affiliate with more community hospitals and group practice organization. Hospitals which have not participated in training, will begin to establish residency programs. Those which are currently involved in graduate education will have the opportunity to expand their role.

Monitoring the distribution of specialties among residency training programs becomes more complex when the "50% in primary care" requirement is implemented at the micro level. The external review process conducted by such groups as the Residency Review Committees and the Liaison Committee on Graduate Medical Education will be responsible for determining whether the schools' programs actually meet the definition of primary care stipulated in the legislation and interpreted by the national residency review mechanism and whether the educational content is acceptable. Based upon these professional findings, the federal government will take any necessary action to guarantee compliance with the law.

The federal government has two effective mechanisms at its disposal for enforcing the limitations in number and mix of residency positions: capitation payments to schools and federal third party reimbursement for health care services authorized by Medicare and Medicaid. Federal payments through the Medicare and Medicaid programs fund a major portion of stipends for residents. The payments to hospitals are based on services rendered Medicare and Medicaid beneficiaries by physicians in training. Federal participation in the support of residency training thus provides necessary leverage for the federal government to effect the policy changes mandated by Congress.

Capitation payments to medical schools can also be used to induce schools to meet national priorities in the training of physicians. The withholding of either capitation funds or federal reimbursement for services provided to Medicare and Medicaid beneficiaries could be imposed as a sanction against non-compliance whether the mandated goal of having 50% of all residencies in primary care was applied at the national level or to every school.

Recently Assemblyman Duffy introduced legislation (AB 2686) that would establish a mechanism at the State level to certify graduate medical education programs in order to assure that 60% of graduate training positions be in the fields of family practice, general internal medicine and general pediatrics. Its purpose is to also assure that a demonstrated need for the specialty exists in the region where the training facility is located. The objective is to correct the perceived maldistribution of physicians geographically and by specialty.

5. CLINICAL TRAINING SITES

Choosing Sites for Training: We have described the current status of primary care training programs in California, and identified underserved areas in the State. Determining "the appropriate location of clinical training programs to meet public policy objectives of decentralization..." and other equity of access issues is a more difficult task. Discussion of certain general issues must precede any specific locational decision. The first is what level of clinical training is being considered: undergraduate (medical students), graduate (interns and residents), or continuing education (practicing MDs). These programs often have differing site, faculty, curriculum and patient requirements. Although any program in primary care should include some or all of the basic elements, emphasis will vary depending on the trainees and the duration of the training. Worthwhile undergraduate training programs can take place almost anywhere from the university hospital to the solo practitioner's office, but they demand the greatest time commitment from the faculty preceptor. For the medical student is essentially a non-revenue producing onlooker who must be carefully and continually tutored and monitored. Reimbursement for the remote site practitioner - faculty member is a necessary inducement to have him/her undertake teaching responsibilities, yet it represents a considerable burden for the financially hard-pressed medical center. Residents might provide a significant amount of service (and bring in revenue) in their training program setting, but require a more sophisticated educational experience and larger patient base with a wider disease spectrum. This is often beyond the solo practitioner's scope, but is possible in many group practice settings. Practicing physicians on the continuing education level, need refresher courses on the "state of the art" in various special-

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ties, usually taught by medical school subspecialist faculty, and need the facilities of at least a referral community hospital.

A second issue is the perennial service versus teaching/research conflict which afflicts every medical school and every program with which the university medical center is connected. Clearly, federal and State capitation support for medical education have improved the balance between teaching, research, and science. University medical centers often view their primary mission as educational and only undertake service functions that clearly contribute to their educational mission. Those functions are, however, difficult to separate because medicine and the other health professions are service professions. The university medical centers have been able to combine these functions quite well in highly specialized tertiary care areas (hemodialysis and kidney transplants, open heart surgery, cancer radiotherapy). They are less capable of combining them in primary care. For here they are in competition with private practitioners and with managerially-efficient group practices. The organization of their hospitals emphasizes acute care for patients with complex or serious problems. They are not well organized to provide continuity of care nor allow for integration and coordination of patient services, both essentials of primary care. Before they embark on this relatively new path and extend themselves beyond their walls, they are going to carefully access whether the proposed service site fits their educational needs.

Given these incongruities, it might be more efficient to bypass the universities and fund postgraduate clinical training programs directly in serivce-oriented community hospitals. But this runs counter to many currents. While 55% of the current Family Practice residency positions are in community hospitals that are not university affiliated, the majority of the new family practice programs being accredited are university-affiliated and the university-affiliated programs will soon dominate the picture. Moreover, a 1974 survey of American medical school deans revealed that they felt one of the most likely events in the next two decades would be the assumption of responsibility for graduate medical education by academic medical centers.(30)

There are many who believe that intervening at the residency level has the most tangible and immediate impact on practice type and location. Again, the Congress is an interested party. Congressman Paul Rogers believes that "some mechanism must be found to influence the number and types of first-year residency positions in order to overcome specialty maldistribution."(31) There is some evidence of movement in this direction on the profession's part. At a January 1976 meeting of the National Academy of Sciences' Institute of Medicine dealing with primary care manpower policy, organizations representing the chief primary care specialties (internal medicine, pediatrics, and family practice) all supported the recent Coordinating Council on Medical Education (CCME) statements that 50% of future U.S. medical graduates enter primary care practice.(32) Both federal and state governments could establish mechanisms to assure that these formulations are implemented at the residency level.

An often overlooked intervention point is at the continuing education level. While those outside the profession rarely view this as a clinical training program, it has clear implications for the public policy objectives enunciated by the State. Referring back to the Medical Dean's Survey, a "most likely to occur" change over the next twenty years was that the academic medical centers' responsibility for continuing education would become of equal importance to their current missions.(30) Studies of physician locational decisions have always highlighted the cultural and scenic attractions of a location or the key factor in these decisions, but continuing educational opportunities are also cited as important factors. The availability of bi-monthly seminars, for example, at the area community hospital on the newer preparations of insulin for treating diabetes or new tests in the evaluation of angina taught by visiting university faculty may be just what is needed to attract new MDs to underserved areas. It certainly would also upgrade the skills of these practitioners already in isolated areas. Basically, the government funding agency must look on clinical training programs as a continuum from entry into medical school through housestaff experience into actual practice. To meet its public policy objectives, the State should evaluate activities on all three levels and try to ensure that the programs on one level are coordinated with, and not independent of or at cross-purposes with, the others.

Several innovative programs deserve mention that have been established around the nation and are directed towards serving underserved areas and decentralization. Dartmouth Medical School in Hanover, New Hampshire has established a "teaching community" program. Several communities in the state with populations ranging between 12-15,000 are providing educational opportunities for four students and two primary care residents full-time throughout the year. Existing clinical facilities are used, since the medical center views them as unique resources for demonstrating the primary care system to students and residents. In order to qualify as a teaching community, the community with the help of Dartmouth, had to coordinate its health care system (local hospital, private practices, home health services, and so forth) to serve as a suitable model for the teaching of quality primary care. Once the teaching program is established, full-time Dartmouth faculty make regular visiting teaching rounds to the community and are available as on-site consultants to the community's practitioners on a continuing basis. One community has already found it easier to keep MDs since joining the program.(33)

The University of Washington School of Medicine in Seattle sponsors the "WAMI" Program whereby medical students are sent on six week rotations to remote practice sites in Washington, Alaska, Montana, and Idaho. Participating practitioners receive faculty appointment at the medical school and come to the medical center during the rotation for continuing education, full-time faculty members also visit the practice site to evaluate the training provided and the practice. Early studies have indicated a rural and primary care practice preference for WAMI graduates, and a positive change in the participating practitioner's practice.(34)

Area Health Education Centers (AHECS) were established by federal funding under the Comprehensive Health Manpower Training Act of 1971. They were designed to be satellites of university medical centers and to serve as outreach educational centers and upgrade the quality of health services in their region. The University of North Carolina is an exemplary model, having organized a state-wide system of nine AHECs serving nearly all of the state's one hundred counties. Duke and Bowman Grey University Medical Schools, both private schools, are now being drawn into the system as well. The AHECs represent either a single community hospital or a consortium of hospitals and each AHEC has a single director counselled by a community advisory board. The AHEC are undertaking a wide variety of activities, including expanded off-site training for medical students, primary care residencies, training of emergency medical technicians (EMTs), refresher courses for inactive nurses, continuing education for rural practitioners, involvement in secondary school counselling with regard to health careers, and regionalization of medical libraries.(34) (35)

Criteria for Remote Site Training Projects

1. Medical community of sufficient size, including a sufficient number of family physicians and specialists in all major fields who are committed to teaching.

   Support and commitment of hospital administration, executive committee, and medical staff of involved hospitals and local professional organizations.

2. Complete hospital facilities, which normally include all clinical services, together with well-equipped laboratory, radiology, and library facilities.

3. Active clinical volume representing a cross-section of clinical problems.

4. Equipment appropriate to the medical practice, basic textbooks and journals, etc., as well as physical space for the students should be available at the practice setting.

5. Emphasis should be placed on the ability to develop and sustain a close interaction between the remote site community faculty and the central School of Medicine faculty.

6. Geographic and logistic feasibility for the University support of the decentralized program.

   Philosophic agreement between the community and the University based upon mutual need and desire for the proposed affiliated program.

   Adequate start up and operational funds.

7. Trainee-to-community faculty ratio that will assure adequate supervision of the trainees.

8. Departmental support of the program in its educational objectives within each clinical department.

9. Active support from the local chapters of various professional organizations.

10. The sites should be re-evaluated at first annually and then perhaps less frequently, or if there is any change in health professional staffing at the remote site.

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Mechanisms for Upgrading Training in Remote Site Locations

1. Resources to provide assistance to the community faculty for the development of teaching skills, problem solving, evaluation techniques, etc.

2. Recognition by the State that the need for faculty is in excess of that normally provided in student/faculty formulas for the School of Medicine curriculum in general.

3. Living facilities for the trainees, including spouse when appropriate, and possibly stipends, recognizing the fact that the trainees usually must continue to maintain their usual residence at the School of Medicine site.

4. Travel funds for students and School of Medicine and community-based faculty.

5. Stipends for the community-based faculty participating in the program.

6. When necessary, initial acquisition of basic clinical references for the remote site.

7. Provision, on a pilot basis, for developing audio/visual instructional materials.

6. SUBSTITUTABILITY OF MID-LEVEL PRACTITIONERS

This section discusses the suitability of utilizing mid-level health practitioners to develop an effective and efficient manpower system for delivering comprehensive health care for California's population. In this discussion, mid-level practitioners will include physician's assistants and nurse practitioners. The paper will focus on the following issues:

1. Special conditions in California that indicate the need for utilizing mid-level practitioners,
2. Nature and productivity of key types of mid-level practitioners,
3. Implications for utilizing mid-level practitioners in meeting California health manpower needs, and
4. Barriers.

Conditions that indicate the need for mid-level practitioners in California

Research by Reinhardt(42) suggests that the health care system is indeed inefficient in its use of resources. He concludes that if physicians were to act as rational creatures, the productivity of the health care system might be increased by as much as 25%. Such improvements could be achieved merely by the employment and use of more paramedical aides. Physicians, as a group, appear to be notably inefficient in delegating tasks to others.

California's health goals will not be achieved unless an efficient, effective and equitable system of manpower is established that can deliver comprehensive health services. Few considerations in the health manpower field seem to offer so much promise for improvements in health care delivery as does substitution among manpower types.

Reinhardt and Smith(43) state that:

"Almost all research on health manpower substitution points to the conclusion that the typical provider of ambulatory care - individual practitioners or even group practices or clinics - have not pushed the substitutions of paramedical for medical manpower to the extent that is economically desirable."

Nature and productivity of key types of mid-level practitioners

A. Physician's Assistant (PA)

One of the ways to expand the supply of medical services and to increase the productivity of the physician is to delegate relatively simple, repetitive and standardized tasks to lower level workers or paraprofessionals. The physician's assistant is one of the chief types of personnel being used to expand the supply of personal health care services. The California Assembly Bill 2109 and the Physician's Assistant Law of 1970 legally recognized this new category of health manpower in the State and established a framework for developing training programs and practice standards for physician's assistants.(44)

The Song-Brown Family Physician Training Act (45) established a medical training contract program designed to encourage the training of the family physician and the primary care physician's assistant. Song-Brown Act funds trained twenty physician's assistants graduating in 1975 and will provide funds for the graduation of 33 new PA's in 1976. Current plans are to graduate 26 new PA's in 1977 and 9 in 1978, for a total of 88 funded by the programs during the fiscal years 1974-78.

The three California institutions that are training primary care PA's are:

--UCLA/Charles R. Drew Postgraduate Medical School

--Foothill College/Stanford University Hospital

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--USC/LAC Medical Center.

Training for emergency care and for orthopedic physician's assistants are offered by:

--USC/LAC Medical Center (Emergency Care)

--UCLA/Charles R. Drew Postgraduate Medical School (Emergency Care)

--USC/Cerritos College (Orthopedic)

--Foothill College/Stanford University Hospital (Emergency Care)

As of February 1974, there were 177 PA's approved by the California Board of Medical Examiners for supervision and employment in the State. Of this group, 144 are working in primary care, 23 in emergency care and 10 in orthopedics. All but 11 of these PA's were trained in California.

1. Function

The physician's assistant is defined by the American Medical Association as follows:

> "The assistant to the primary care physician is a person qualified by academic and clinical training to provide patient care services under the supervision of a licensed physician in a wide variety of medical care settings which are involved in the delivery of primary care. The functions of a primary care physician are interdisciplinary in nature involving medicine, pediatrics, obstetrics and psychiatry . . ."

The PA provides a variety of personal health services in an assisting role to the primary care physician. These services are described to include but not limited to the following:(46)

"--receiving patients, obtaining case histories, performing an appropriate physical examination, and presenting meaningful resulting data to the physician

--performing or assisting in laboratory procedures and related studies in the practice setting

--giving injections and immunizations

--suturing and caring for wounds

--providing patient counseling services; referring patients to other health care resources

--responding to emergency situations which might arise in the physician's absence within the assistant's range of skills and experience, and

--assisting the employing physician in all settings such as the office, hospitals, extended care facilities, nursing homes, and the patient's home.

The ultimate role of the assistant and his functions vary with his individual capabilities and the specific needs of the employing physician, the practice setting in which he works, and the community in which he lives."

The 1970 report of the Ad Hoc Panel of New Members of the Physician's Health Team, Board of Medicine, National Academy of Sciences, described several types of physician's assistants which it categorized into three levels of functioning, popularly referred to as A, B, and C. These types or levels are distinguished primarily by the nature of the service each is best equipped to render, by virtue of the depth and breadth of their medical knowledge and experience. The report distinguishes the type A assistant from the B and C types by his ability to integrate and interpret medical findings on the basis of general medical knowledge and to exercise a degree of independent judgment. According to this classification scheme, specialty physician's assistants, such as the orthopedic and urologic assistants, would function at the B level and medical assistants (office) and practical nurses would function at the C level.(73)

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TABLE 1—Relative Responses to Task Delegation Questionnaire

Laboratory and Related Tasks	Could & Should be Delegated to Non MD	Task is Currently Being Delegated to Non-MD		Sites with Physician Assistant			Sites with Nurse Practitioner			
	ASIM Survey (%MD)	ASIM Survey (%MDs)	Control Site VS	NM	CT	GX	KC	NO	SL	NP
Obtain and mount electrocardiogram tracings	—	94	Y	Y	Y	Y	—	—	—	Y
Obtain venous blood samples for lab	94	72	Y	Y	Y	Y	Y	Y	Y	Y
Procure urine sample for lab	—	96	Y	Y	Y	Y	Y	Y	Y	Y
Perform urinalysis (glucose, protein)	57	94	Y	Y	Y	Y	Y	Y	Y	Y
Prepare urine for microanalysis	97	91	N	Y	Y	Y	Y	Y	Y	Y
Determine hemoglobin	98	91	Y	Y	Y	Y	N	Y	Y	Y
Determine hematocrit	98	93	Y	Y	Y	Y	N	Y	Y	Y
Perform blood cell counts, smears or both	97	91	Y	Y	Y	Y	N	Y	Y	Y
Perform pulmonary function studies	89	58	Y	Y	Y	Y	N	—	Y	—
Perform Master's two-step exercise test	87	62	Y	Y/N	Y/N	N	N	—	—	—
Perform skin tests (allergic, fungi, tuberculosis (Tbc))	77	47	N	Y	Y	Y	Y	—	Y	Y
Therapy										
Administer immunizations	90	63	Y	Y	Y	Y	Y	—	Y	Y
Administer medications intramuscularly	90	61	Y	Y	Y	Y	Y	Y	Y	Y
Administer medications intravenously	42	12	N	N	Y	Y	Y	N	—	N
Perform ear irrigations	87	28	N	Y	Y	Y	Y	Y	Y	Y
Remove sutures	89	18	N	Y	Y	Y	Y	Y	Y	Y
Give diet instruction for obesity, diabetes, etc.	71	20	N	Y	Y	Y	Y	Y	Y	Y
Clerical and Office Tasks										
Fill out insurance forms	—	86	Y	Y	Y	Y	Y	Y	Y	Y
Do billing	—	96	Y	Y	Y	Y	—	Y	Y	Y
Order refills of prescriptions with physician authorization	93	84	N	Y	Y	Y	Y	Y	Y	Y
Schedule appointments for X-ray and lab work	97	94	Y	Y	Y	Y	Y	Y	Y	Y
Schedule admissions to hospital	87	66	Y	Y	Y	Y	Y	N	Y	Y
Schedule appointments on referral cases after conferring with MD	96	92	Y	Y	Y	N	Y	Y	Y	Y
Type progress notes on chart	—	70	N	Y	Y	Y	Y/N	Y	Y	Y
Physical Examination Tasks										
Obtain height and weight	—	81	Y	Y	Y	Y	Y	Y	Y	Y
Take blood pressure on initial visit	—	17	N	Y	Y	Y	Y	Y	Y	Y
Take blood pressure in following hypertensive patient	—	21	N	Y	Y	Y	Y	Y	Y	Y
Take temperature	—	76	Y	Y	Y	Y	Y	Y	Y	Y
Administer screening tests for hearing	93	47	Y	Y	Y	Y	Y	—	Y	Y
Administer screening tests for vision	94	69	Y	Y	Y	Y	Y	—	Y	Y
Perform tonometry	51	15	N	Y	N	Y	Y	—	—	—
Perform proctoscopic examination	9	1	N	Y/N	N	N	Y	N	—	—
Perform pelvic examination and do Pap smear	6	1	N	N	Y	Y	Y	Y	—	—
Perform Pap smear only	34	3	N	N	Y	Y	—	Y	—	—
History and Patient Contact Tasks										
Take and record routine elements of history (family, operations, injuries, etc.)	60	13	N	Y	Y	Y	Y	Y	Y	Y
Take and record history of present illness	28	4	N	Y	Y	Y	Y	Y	Y	Y
Take and record elements of systemic review	37	5	N	Y	Y	Y	Y	Y	Y	Y
Provide telephone advice on routine medical questions	61	43	N	Y	Y	Y	Y/N	Y	Y	Y
Provide (a) telephone advice on routine minor medical problems and (b) schedule patient for examination at office if necessary	67(a) 77(b)	76	N	Y	Y	Y	Y	Y	Y	Y
Visit nursing homes for routine medical rechecks	43	3	N	Y	Y	Y	Y	N	—	—
Visit patients' homes to determine necessity of physicians' exam at home	65	15	N	Y	N	Y	Y	N	—	Y

Y = Yes   N = No   Y/N = Performed by Non-MD in the Presence of MD   — = Not Applicable or No Response

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The American Society of Internal Medicine obtained data on 3,425 members in 1969 concerning their attitudes toward anticipated task delegation to physician extenders. A similar study was repeated in 1973 by Doctors John K. Glenn and Jay Goldman at the University of Missouri-Columbia at eight medical practices. It was found, with minor exceptions, that actual task delegation patterns conform with the 1969 study as to which task "should and could" be delegated to physician extenders.(48)

Despite the difference in training of PA and NP personnel, Glenn and Goldman found no distinguishable difference in delegation patterns, although nurse practitioners more often emphasize patient counseling and education. The researchers felt that the shared experience and personal attitudes of physicians and physician extenders may quickly outweigh formal physician extender training in determining task delegation patterns.

b. Productivity

A review of recent literature on the use and effectiveness of physician extender types of workers indicates that the productivity of physicians can be substantially increased.

Rafferty(49) estimates that under conditions of continuous production the average solo practitioners in medicine could profitably employ twice as many auxiliary health workers as he does -- four instead of two, increasing the number of patient visits per physician per week by 25%. He states that activity analysis shows how primary medical care practice can be organized to increase the productivity of individual physicians by 75% through the use of PA's.

A recent study by Nelson, et al.(50) found that the addition of a PA to an ambulatory care practice increases the practice's productivity. Practices using PA's (medexes) had a 12% increase in the number of patient visits during the first year of training and 1 3/4 years later had an average increase of 37%. The medex by himself provided care to 28% of the patients and, in company with the physician, to another 10%. This 37% increase is comparable to the 40% increase reported by Smith, Auderson, and Okimoto.(51)

The use of PA's in rural and medically underserved areas appears to be particularly appropriate. Duttera and Haslan(52) reported an evaluation data of using physician extenders in the rural southeast. They claim that a large percentage of patient problems in a general practice are appropriate for physician extender activity and that approximatley 50% of the problems currently being seen by physician extenders fall into the categories of trauma, acute respiratory problems, administrative exams and chronic cardiovascular problems and the physician extenders perform these duties well.

There have been few studies to indicate the cost-effectiveness of adding PA's to primary care practice teams. One recent study by Nelson et al.(53) has determined that the addition of a MEDEX to 10 of 12 practiced studied resulted in substantial gains of revenue over expenses.

3. Acceptability

The use of PA's has generally gained favorable acceptance by the public, physicians and health professionals. A recent study by Haug Associated, Inc.(54) for the Board of Medical Examiners, State of California found the following:

1. The public is quite favorable toward being cared for by a physician's assistant. Eighty percent of the sample stated they "definitely" and "probably" would be willing to be cared for by a PA assuming he was qualified to perform the task. Only 14% were not sure whether or note they would be willing to have a PA care for them and only 6% expressed negative feelings.
2. Physicians are generally favorable (ie. approximately, 2/3's

rated the program excellent or good) toward the PA program concept although only a minority of physicians (ie about 20% - 25%) are interested in having a physician's assistant at this time.

3. Allied health professionals are favorable toward the PA program concept. Almost 80% stated that the concept sounds like an excellent or good program.

B. Nurse Practitioner (NP)

The nurse practitioner (NP) is another category where the delegation of physician tasks has occurred. This general classification includes NP's who work in primary care, family, pediatric, family planning, OB-GYN, geriatrics, mental health and school settings. For a detailed account of the historical background, roles, legal status and barriers to the use of nurse practitioners refer to the paper "Training and Utilization of Mid-level Practitioners: a partial solution to the shortage of primary health care providers in California", by Irene Pope.

The NP is defined(55) as a licensed nurse who has acquired additional medical knowledge and skills to gather data, make hypotheses, identify problems, implement management and evaluate the results in consultation with a licensed physician and surgeon. The NP also continues to function as a nurse providing direct patient care. (See page 377 for a more complete discussion.)

1. Function

The main functional difference between the NP and the PA is that the NP practices under his or her license as a nurse and consults with the physician who retains final medical responsibility for the patient. In California, specific approval of the physician to supervise the NP is not required. The PA is trained to work under the immediate supervision of a physician primarily in an office setting and performs tasks essentially medical in nature. The NP performs both medical and nursing tasks.

The tasks performed by NP's vary according to the nature of the specialty in which they have been trained and in which they work. A career model for nurse practitioners which details a number of specific functions and tasks is described by Lucille Wood.(56)

2. Productivity

One of the easiest settings to demonstrate the productivity of NP's is in pediatric practice. According to Reinhardt and Smith(69) all studies of pediatricians show that roughly 40% of their patients are well and 50% of the pediatrician's patient contact-time is devoted to well care. In addition, to well-child care another 30% of the pediatrician's time is devoted to minor illnesses which include the common cold, upper respiratory tract infections, ear infections and G-I disorders. They conclude that the physician's time can be reduced by 50% by the use of 1.5 pediatric NPs.

A recent study by Spitzer et al.(53) on the effects of substituting nurse practitioners for physicians in primary care practice demonstrated that a NP can provide first-contact primary clinical care as safely and effectively, with as much satisfaction to patients, as a family physician. They also found that the NP's were able to function alone successfully in 67% of all patient visits.

A similar experience is resulting from a nurse practitioner project in a community hospital in Sonoma County, California.(58) Preliminary data indicate that seven NP's are providing a wide range of health care services in health maintenance, acute and chronic disease, maternity and various emergencies and illnesses. Some patients were seen by the physician and nurse working as a team, and others were seen by the nurse working along but with physician backup.

The effectiveness of NP's in OB-GYN and family planning practices has also been demonstrated. Using women's health - care specialists to perform services such as taking medical histories, perform specified physical examinations, taking Pap smears, inserting IUD's and performing other functions under standing medical medical policies and procedures; Ostergard and others(59, 60) were successful in improving the productivity of physicians. In inserting IUD's they found that the incidence of complications and other outcomes were no different for those inserted by paramedical personnel versus those inserted by physicians.

In another reference Ostergard states(61) that if paramedical family planning specialists were used in the delivery of family planning services it would reduce the number of physicians required on a full time basis to 20% of that required under the existing health care system. The 80% savings in physician manpower has great implications for the future delivery of family planning services.

Brunetto and Birk(62) in a demonstration where primary care was provided by multidisciplinary teams staffed by physicians and physician associates, conclude that if this primary care model were spread throughout the U.S. the present number of 125,000 practicing primary physicians would be adequate to meet the national need.

Implications of utilizing mid-level practitioners in meeting California's health needs

The relatively recent introduction of MLP's into our health care system has allowed very little time to collect extensive data upon which to develop formulae for determining manpower requirements. The studies cited are relatively new and scattered and care must be taken in developing standards for utilizing such personnel in generalized situations. Nevertheless, these data do indicate the effectiveness and productivity of PA's, NP's, and

MLP's.

In view of the data that already exists and the specific conditions that are prevalent in California, the following factors justify the use of MLP's as part of an effective and efficient health manpower system for the State.

A. Functional needs of California's health priorities

The 1971 California State Plan for Health(63) listed ten priority health problems that affect the optimal health and well-being of the state's population:

- drug abuse
- venereal disease
- mental health
- alcoholism
- mental retardation
- chronic diseases
- dental health
- neurological handicaps
- suicide
- infectious diseases

The alleviation and/or resolution of these health problems in most, if not all, cases requires that the patient take responsibility for, understand and participate in the health diagnosis, treatment and maintenance process connected with the condition. Unless individual consumers and patients are willing and able to follow life-enhancing procedures and behaviors, the prevention, elimination and control of unwanted personal health problems will be impossible to attain or ineffective at best.

For example, an individual must take responsibility for not drinking alcohol to excess, to avoid smoking, to not drive his automobile dangerously and to eat an adequate diet; he/she must use contraceptives or prophalactics to avoid unwanted pregnancies or venereal disease; if he/she has a disease such as obesity, diabetes, hypertension or rheumatic heart disease, they are responsible for taking medications and behaving wisely as defined by their physician or other health team member.

Colladay(64) has made an extensive review of the literature on the role of patient participation and productivity in the medical care sector. He cites numerous studies that demonstrate improved health outcomes when patients, and sometimes other family members, participate in choosing levels of utilization, phasing treatments, and monitoring and evaluating therapy and organizing and executing programs of health maintenance. Examples of this include early diagnosis of cancer, cardio-vascular disease, tuberculosis and dental problems, self care in diabetes and diet management. Golladay concludes that pilot programs have indicated that patient education and self-care has been successful in both reducing the costs of care and improving the sociopsychological welfare of patients.

A report by Oswick, Shavell and Witte(65) illustrated the cost benefit of a national measles-immunization program to be a net benefit of $423 million and the DHEW has estimated the cost/benefit ratio for seat-belt installation at more than $1,000 saved for every dollar invested.(66)

This research suggests two basic premises: one, that the role of the patient in the delivery of health care should be substantially increased and the patient and/or his family should be induced to undertake preventive rather than episodic care. Two, that health programs and services that emphasize prevention and health promotion can be cost-effective.

All evidence indicates that MLP's can effectively delivery preventive and health maintenance services. Functionally, these kinds of activities are generally not "high level" tasks or operations. Giving health information and educating patients, giving immunizations and first aid, giving guidance and counsel on routine matters, and providing many clinic services such as nutrition, prenatal, well baby and adolescent care are examples of activities that mid-level practitioners have learned to perform effectively. A large part of the preparation and training of PA's and NP's has been to learn to educate patients, to perform routine diagnostic and treatment tasks and to assist the patient in maintaining his own health status.

Barriers. Identification of the various barriers is a necessary first step in deciding how fast we should move in expanding the very limited training programs for nurse practitioners. Some of these are identified and discussed in this section.

A. Guidelines for Standardized Procedures

The new definition of R.N. scope-of-practice (Sections 2725, 2726 B & P Code) provides that some functions (especially those where medical and nursing practice overlap) may be performed "according to standarized procedures." For practice settings that are *not* licensed health *facilities*, the law defines "Standardized Procedures" as follows:

> "Policies and protocols developed through collaboration among administrators and health professionals, including physicians and nurses, by an organized health care system which is not a health facilty licensed pursuant to Chapter 2 (commencing with Section 1250) of Division 2 of the Health and Safety Code. Such policies and protocols shall be subject to any guidelines for standardized procedures which the Board of Medical Examiners and the Board of Registered Nursing may jointly promulgate; and if promulgated shall be administered by the Board of Registered Nursing." (67)

The Attorney General has advised the two Boards that the guidelines which they adopt should be broad and general in nature and should leave reasonable freedom and flexibility for health care systems to adopt policies and protocols which may expand the usual areas of overlap between medicine and nursing practice.

If the two regulatory boards adopt guidelines that are consistent with the concept expressed by the Attorney General curbing only those rare excesses which would be considered highly questionable by the vast majority of medical opinion, then the guidelines will not seriously inhibit the use of the new practice definition to expand the practice of some registered nurses into new areas of overlap with medicine. But it needs to be pointed out that neither of the regulatory boards supported AB 3124, the original and major bill providing a new difinition of R.N. scope-of-practice and that neither of the boards has adopted an enthsiastic position of implementing the new law. The questions posed to the Attorney General in the letter of November 1974 from a joint committee of the two boards, suggest that the boards may approach the development and adoption of guidelines with a very conservative and cautious attitude toward changes in scope-of-practice.

B. Professional Corporations

The Moscone-Knox Professional Corporation Act, enacted in 1968, provides for the formulation of a special type of corporation known as professional corporations, to render "professional services in a single profession." (68) The corporation is authorized to render professional services only if it holds a currently valid corporate license or certificate issued by the appropriate professional licensing agency.

Section 13405 of the Act provides that such professional corporations may lawfully render services through employees, who are licensed in the same profession as the corporate license. Any other employees of the corporation are explicitly prohibited from rendering "any professional services rendered or to be rendered by said corporation."

It is very clear that this law does not permit the organization of a multidisciplinary professional corporation, nor does it permit a medical professional corporation to employ a registered nurse to render any professional services whatsoever. Since many physicians who practice as professional corporations do employ nurses, it is apparent that this provision is being interpreted loosely with reference to employees. However, it seems doubtful that this would be allowed to extend so far as to allow nurse practitioners as employees of professional medical corporations.

There is a parallel provision in the Medical Practice Act (69) which provides for licensure of medical corporations organized pursuant to the Professional Corporations Act.

C. Other Corporations

Other provisions of the Medical Practice Act (70) prohibit any corporation from engaging in the practice of medicine or from employing a physician to do so. There are two exceptions: 1) One or more physicians practicing as as professional corporation are exempted from the more general prohibition, if practicing pursuant to the Professional Corporations Act and parallel provisions of the Medical Practice Act; and 2) By special, individual action by the Board of Medical Examiners, a corporation can employ a physician to give professional services if the corporation makes no charge for such services.

Except in the case of a licensed hospital, for which there are special provisions, it would appear that the Medical Practice Act prohibits the use of corporate administrative structure for collaborative practice between physicians and nurses. The prohibition is against the participation of the physicians in such a structure.

D. Partnerships

The Medical Practice Act (71) prevents any physician from participating in a multidisciplinary partnership which operates under a fictitious (partnership) name. It is not clear whether the law permits a physician to enter into a partnership with a nurse or another healing arts professional if each partner practices under his own name and license. There is probably a need for legal research on this point.

The Medical Practice Act permits partnership practice by a group (or two) physicians, or by a group of podiatrists, in either case using a fictitious name, but with narrow restrictions on the name style of the partnership. For a physician partnership, the name sytle must include the phrase "Medical

Clinic".

E. Collaboration Agreement

The statement of intent in Section 2725 of the Nurse Practice Act includes the following very significant language:

> "It is the legislative intent also to recognize the existence of overlapping functions between physicians and registered nurses and to permit additional sharing of functions within organized health care systems which provide for collaboration between physicians and registered nurses."

One possibility which appears to offer real promise for serving presently unserved or underserved populations with primary health care, is a collaborative system of private practice which may include a physician and a nurse practitioner, each with an independent (fiscally) private practice, but with a collaboration agreement under which the physician would be reimbursed by the nurse practitioner for consultation and review services, as provided in the "standardized procedures" which are developed to implement the system of collaboration. Possibly the standardized procedures as well as the business agreements could be incorporated into a single collaboration agreement.

There are limitations on what could be included. For example, the Medical Practice Act prohibits a physician from "fee splitting".

There is a need for legal research on collaboration agreements which might include the development of sample or model agreements.

F. Nurse Practitioners as Employees of Physicians

This is the form of collaboration which seems most readily acceptable to the medical profession, but it also has some serious limitations. With the exceptions noted, there are no legal prohibitons in manpower licensing laws.

Perhaps the most serious problem is the problem of malpractice liability, and malpractice insurance. In an employer-employee relationship, both the nurse and the physician are exposed to malpractice risk based upon acts or omissions of the nurse.

Nurses have maintained a low profile with reference to liability suits, and are able to obtain malpractice insurance at very modest cost, whereas physicians are involved in such a serious crisis of insurance cost that some are leaving the profession, moving to other areas, or limiting their practice articicially, all of which have a tendency to aggravate present shortages of primary health care services. It is ironic, in view of these facts, that the addition of a nurse practitioner as an employee usually aggravates the physician's malpractice insurance problem. Some insurance carriers are requiring expanded coverage and higher rates for physicians who employ nurse practitioners.

Until and unless it is demonstrated (and it will take time) that team practices will tend to lower the physician's liability profile by changing the attitudes of patients and possibly by reducing the incidence of errors, it is only realistic to expect that the malpractice insurance problem for physicians who employ nurse practitoners will get worse.

As pointed out earlier, physicians who operate as professional corporations are forbidden by the law to employ nurses, nurse practitioners, etc., to render any professional services. Whether or not the present non-compliance will be permitted to continue, is problematical.

It has been fairly well documented that the main reason so many registered nurses abandon active practice is the relativelylow level of compensation (economic and ego-satisfying).

It is not possible to estimate the proportion of potential mid-level nurses who would reject this career route by reason of the lower expectations of compensation associated with being an employee of a physician. Neither is it possible to estimate the proportion of physicians who would opt against employing a nurse practitioner but would be willing to enter some other collaborative arrangement. However, it can be reasonably assumed that a variety of possible administrative arrangements would offer greater encouragement to the societal use of mid-level nurse practitioners than a restrictive range of options.

G. Third-Party Payers

Nearly all third-party payers, including insurance carriers and health service plans, define services in terms of the (a) institutions where the care is given, or (b) the licensed professional (not always restricted to the licensed healing arts) who gives the care. With a few exceptions, (such as services of religious practitioners which are covered in some programs including Medi-Cal) the contracts require that all covered services must either be ordered by or performed by a licensed physician.

For example, a Blue Cross contract provides that:

"a. Hospital services set forth herein above shall be limited to those customarily furnished by the hospital and ordered by the attending physician or surgeon......" and

"b. Professional services of a registered graduate nurse...when furnished in connection with the diagnosis and necessary treatment of any illness, disease or bodily injury, and be authorized by a physician or surgeon and for only as long as such authorization is given."

In most programs, policies, or contracts, "medical" and "surgical" benefits are further defined as services rendered by a physician or surgeon.

The net result, or at least the general interpretation has been that nursing services can be reimbursed in two possible ways:

1. Hospital Services (and sometimes other institutional care services) are covered and, thus, indirectly, general nursing care and intensive care services are paid for.

2. Where reimbursement is made directly for professional nursing services, the service is limited to traditional "private duty" nursing care by separate provisions which exclude medical and surgical services performed by anyone other than a physician.

In summary, no major third-party payers, currently have arrangements or contracts which would cover services performed by nurse practitioners practicing outside of a hospital. It is understood that some payers are processing physicians'claims which include services performed by nurse practitioners, but, there is a serious question whether they are contractually obligated to do so. None have developed procedures for recognizing nurse practitioners as "providers".

In terms of permitting and/or encouraging utilization of nurse clinicians and nurse practitioners in the collaborative delivery of health care, in primary care and other shortage areas, the government is probably the worst of the third party payers. For example, California's Medi-Cal program even excludes traditional "private duty" nursing from coverage, and certainly makes no provision for the use of multidisciplinary teams to privide primary care. (72)

H. Hospital Privilieges of Nurse Practitioners

To a considerable extent, the prospect for utilizing nurse practitioners in primary care physician-nurse teams will depend on the explicit or tacit granting of hospital privileges to nurse practitioners. There is some tentative indication that hospitals will be more interested in utilizing nurse clinicians and nurse practitioners as hospital employees than in accepting them as attending practitioners to hospital patients.

Until this issue is clarified, either by court test or by private agreement, the question of hospital visits by nurse practitoners and particularly the question of whether nurse practitioners may enter therapeutic treatment orders in a patient's chart, will have to be considered as moot. The actions of individual nurse practitioners are tentative and experimental until the issue is decided more generally by agreement or litigation or both.

It is perhaps worthy of note that the California Department of Health has avoided this issue entirely in writing the new regulations for licensed health facilities.

Aritcle 7 of the hospital regulations deals with administration, including the duties and responsibilities of governing bodies and medical staffs, and with patients rights. It requires that the medical staff (which controls and regulates professional practice in each hospital) be composed solely of physicians, plus dentists and podiatrists when dental or podiatric services are provided.

The regulation requires that physicians, dentists and podiatrists who "perform any service for which a license is required" must be currently licensed. It deals with quality of patient care provided by residents, interns, and medical students. Nowhere is there any reference to patient care by nurse practitioners or to staff priviliges. This absence will undoubtedly be interpreted by many as a prohibition against staff privileges for nurse practitioners.

It would appear that utilization of nurse practitioners in the care of hospitalized patients will be seriously inhibited by the present regulations.

7. RECOMMENDATIONS

It is recommended that:

1. The state of California maintain on a continuing basis a health manpower intellignece system that is responsible for collecting, collating and analyzing data and information required to monitor physician (and other) health manpower and health science education trends systematically. It is recommended that this be a joint effort between the California Postsecondary Education Commission, the Senate and Assembly Research Offices, the Health Manpower Unit of the State Department of Health, the regional health system agencies in the State, and the Department of Consumer Affairs.
2. Fund special programs for undergraduate medical schools to encourage medical students to enter primary care.
3. Based on the recommendations of the Health Manpower Policy Commission, the Board of Medical Quality Assurance should certify the number of surgical specialities, family practice and other primary care specialty slots in State graduate medical programs.
4. Mandate the State Board of medical Quality Assurance to develop a plan by 1977 in cooperation with the 14 health system agencies to assess the need for specialties in their area; and to issue limited licenses to out-of-state applicants to practice only according to openings available in local areas.
5. Provide greater support of family practice residencies and other primary care specialties such as the Song-Brown Family Physician Training Act (SB 1224).

6. The State should increase enrollment in the medical schools at the University of California by 72 in the entering classes for the next 4 years. In 1975-76, the first-year enrollment for the University of California's 5 medical schools was 561. At this projected increase, the recommended entering class enrollment would be 633 by 1980.

With these projected enrollments, our aggregate physician population will grow from 46,165 in 1975 to 54,732 in 1980; with a corresponding physician/population ratio increase from 201/100,000 to 222/100,000.

7. Require that medical schools allot at least 50% of their direct or affiliated filled residencies to primary care specialties, that is, family practice, general internal medicine, and general pediatrics.

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V. NURSING

1. INTRODUCTION AND SUMMARY

Major Issues and Problems

There seems to be agreement from every research source that the health care system in the United States is changing and is facing increasing pressure to change. Technological and scientific medical advances, coupled with rising costs and expectations for comprehensive care are making demands on the traditional health care system which it cannot meet in its present form.

It is in this context of the changing system that nursing education confronts two basic issues:

1) What kinds of demands for services must nursing be prepared to meet?

2) In what ways must the supply of nurses be adjusted in order to meet the new health/nursing care needs?

Summary of Identified Problems

In examining the data of the supply of nurses and their utilization at present and the projections of nurse supply and demand in the next 15 years, a number of complex concerns are identified. The data analyzed in this report brings up many problems and questions which need to be answered. The following is a summary of these problems and questions posed by the data. Thus the summary of findings of this report includes the questions to be answered by the recommendations:

a) Should nursing training programs be expanded and should new ones be developed? Demand and supply projections indicate a need for more nurses, and statistics show that California is now and is

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likely to remain a debtor state. Yet it is found that there is difficulty for many nurses to find employment in California. Should there then actually be imposed a moratorium on new training programs or even a cutback of nurses trained in California?

b) What can or should be done about the high attrition rate among trained nurses and the low labor force participation of experienced nursing personnel?

c) What can or should be done about the large number of health science program applicants for whom there is no space?

d) Is more clinical training needed by academically trained nurses as nurse employers indicate? What kind of clinical training is needed by emerging nurse professionals?

e) Is the fair representation of ethnic minorities in California in 1975 in nursing education also reflected in the employment of nurses? What about equal opportunity for males in nursing education?

f) How can working nurses upgrade their status professionally and academically when required continuing education does not constitute this upgrading?

g) Can and should nursing education units and clinical functions be standardized? Will standardization aid in the articulation between various levels of nursing education programs?

h) Should emerging nurse roles be articulated with present nursing education levels to create a specific career ladder for nurses?

i) Should the same assumptions regarding allocation of time be made of nursing educators as it is of medical faculty (including time for research activities, community and professional service, and possible advanced studies towards a Ph.D.) as many nursing educators urge?

j) Should the different levels of nursing education (LVN, AA degree nurses, Diploma nurses, Baccalaureate nurses, Public Health nurses, Master degree nurses, etc.) be specified in terms of professional category, salary differentiations, etc.?

k) What kinds of curriculum changes are needed in nursing education to meet the demands of the changing health delivery system?

l) How may nurses have more of a voice in health policy?

m) In what way can the maldistribution of nurse generalists and specialists in California be corrected?

n) How can nursing educations pay for the curriculum development and new programs which will keep them flexible enough to respond to the changing demands for nursing care services?

Summary of Recommendations

The problems listed above and analyzed in the text of this report can be addressed by the Postsecondary Education Commission in a variety of ways. In the chapter on Recommendations it is recommended that the Commission approach these problems via:

1. sponsorship of certain comprehensive studies,
2. support of certain data collection,
3. development of various policy statements,
4. encouragement of certain projects, and
5. direct action such as appointment of nurses on Commission boards and committees

Definition of Licensed Nursing Personnel

Licensed vocational nurses (LVNs or licensed practical nurses as they are called in other states) are graduates of formal programs either in private schools, high school adult education courses or community colleges, of at least 12 months duration, who have successfully passed a written licensure examination issued by the Board of Vocational Nurse and Psychiatric Technician Examiners. LVN's provide much of the patient bedside care in hospitals and in convalescent homes working under the direction of the physician and the registered nurse.

Registered nurses are individuals who have completed specific formal education either in an Associate degree program (ADN), a hospital licensure program (commonly called Diploma programs), or a Baccalaureate degree program (BSN) and who have successfully passed a written licensure examination. Their training may take from two to five years with two-year programs being offered primarily at community colleges and the lengthier hospital and Baccalaureate programs at colleges and universities. The graduates of Diploma (hospital) and Associate degree programs tend to become floor nurses. Graduates of Baccalaureate degree programs tend to become administrators, public health nurses or teachers in nursing programs. All R.N. preparatory programs in California must be accredited by the Board of Nursing Education and Nurse Registration.

Nurse practitioners are registered nurses who have taken six to twelve months additional training in physical examination, disease management skills, and psycho-social health-illness status of individuals, families, and groups. This training is in addition to the basic nursing education. Portions of their practice relating to initiation or change of a medical regimen are subject to policies and protocols developed collaboratively within the practice setting by physicians and the nurse practitioner.(1,15)

2. SUPPLY TRENDS AND PROJECTIONS

"Supply" of manpower usually refers to the availability of those kinds of personnel which require specified formal training; therefore, availability is constrained in size by a qualified pool of personnel.(1) In California, there are three categories of health personnel which are formally trained to provide nursing services and thus constitute the "supply" of nurses. These are:

1. registered nurses,
2. licensed vocational nurses, and
3. nursing aides, orderlies and attendants.

The first two are licensed personnel; the third is not. Their tasks overlap considerably, but their characteristics may be defined differentially according to their training and certification. (See definitions of licensed nursing personnel in the introduction.)

It can be said that "higher education" (postsecondary education) is the main source for the preparation of nursing personnel in California.(2) Therefore, the number, availability, and accessibility of nurse training institutions constitute the major factors in controlling the actual supply of nursing personnel in the State (this refers also to postsecondary education facilities outside of the State, of course.) Plans by nurse training programs to expand or reduce the size of their enrollment, or to change or modify their programs, greatly influence the supply of nurses. Other factors affecting supply as well are: 1) the licensed aggregate supply of nurses, 2) in-migration of trained nurses from out of state, labor-force participation of trained nurses, and 4) distribution of nurse personnel. In the following analysis of the supply of nursing personnel, registered nurses will be dealt with first and then the LVN.

TABLE V-1

ACTIVE REGISTERED NURSE POPULATION RATIOS IN CALIFORNIA: 1965, 1967, 1968, 1970 AND 1975

Year	Total California RN's	Active RN's	Active Percent of Total	Ratio per 100,000 Population[b]
1965	98,438	68,127	69	368
1967	105,887	70,495	66	366
1968[a]	109,936	71,596	65	366
1970[d]	--	77,400	--	387
1973[a] estimate	126,637	82,314[c]	65	396
1975[d]	137,316	92,161	67	434

SOURCES: Health Manpower Council of California, Registered Nurses, 1970 and Board of Nurse Education and Nurse Registration Annual Highlights and Profile of Registered Nurses in California.

[a] 1968 data for active nurses were projected by the Board of Nurse Education and Nurse Registration based upon a sample adjusted for non-response. 1970 data were based upon response of 30,000 nurses and were not projected or adjusted. It is reasonable to assume that the 1970 data overstate active nurses because of the likelihood that inactive nurses probably would have a lower response rate.

[b] Ratio for 1965-68 was estimated by the Health Manpower Council of California based upon population estimates of the California Department of Finance. In 1966, the American Nurses Association conducted an inventory of registered nurses in the U.S. They report 93,649 nurses in California for that year, approximately 5,000 less than the Board of Nurse Education and Nurse Registration for 1965. According to their data, 63% of total nurses were active. We would expect that the California data are more accurate anasmuch as they are prepared by the licensing agency.

[c] 1973 is estimated by applying a 65% activity rate to registered nurse totals.

[d] From James Dei Rossi's data.

ACTUAL SUPPLY OF NURSES

The total aggregate supply of registered nurses in California can be seen in Table V-1 . From those figures of registered nurses submitted by the Board of Nursing Education and Registration, it can be estimated that there was a 39% increase in registered nurses between 1965 and 1975, and a 35% increase in active registered nurses. This compares to a 43.22% increase of active registered nurses in the United States during that period. (See Table V-2). It can also be noted that the ratio of active registered nurses per 100,000 population has gone up in California (from 368 in 1965 to 434 in 1975), although not as fast as it has gone up in the United States as a whole (from 319 active registered nurses per 100,000 population in 1965 to 414 in 1975). California in 1975, however, continues to show a higher ratio of nurses per 100,000 population than the national average.

TABLE V-2
ACTIVE REGISTERED NURSES

CALIFORNIA AND UNITED STATES
1965-1975

	CALIFORNIA		UNITED STATES	
YEAR	Number	Ratio*	Number	Ratio
1965	68,127	368	621,000	319
1970	77,400	387	723,000	353
1975	92,161	434	889,400	414

SOURCE: Migration and the Supply of Health Manpower in California.
Section 2.
Projected Supply and In-Migration of Registered Nurses, James Dei Rossi.

*Ratios are per 100,000 population.

TABLE V-3

U.S. SUPPLY OF ACTIVE REGISTERED NURSES AND NURSE/POPULATION RATIOS

Actual 1970; Projected 1975-1990

	1970		1975		1980		1985		1990	
	number	rate*	number	rate*	number	rate*	number	rate*	number	rate*
Basic methodology[1]	723,000	355	889,400	414	1,099,600	485	1,294,500	541	1,466,700	585
Low alternative[2]	723,000	355	881,400	410	1,076,100	474	1,261,200	527	1,426,200	569
High alternative[3]	723,000	355	886,000	412	1,105,500	487	1,337,400	559	1,535,300	613

*rate per 100,000 population; based on U.S. Census Report and Projections, resident population:

1970 - 203,805,000
1975 - 214,883,000
1980 - 226,934,000
1985 - 239,329,000
1990 - 250,630,000

Three methodologies were used to account for the impact of future funding on nursing school first year enrollment (nursing school here refers to three types of programs - diploma, baccalaureate, and associate degree program):

1 - assumes a moderate overall increase in enrollment (with a decrease in diploma programs and a proportional increase in baccalaureate and associate degree programs)
2 - assumes the same total enrollments as in (1) but with lower completion rates for each program (with the increase spread evenly over all three types of programs)
3 - assumes a higher rate of overall increase than (1) but with identical completion rates (with the increase spread evenly over all three types of programs)

Notes: Figures include all active registered nurses in the 50 States and the District of Columbia (baccalaureate, diploma, and associate degree programs)

Projections include all active registered nurses as of 12/31/70 plus the estimated number of nursing graduates plus the estimated number of those re-entering the profession minus the estimated number lost due to death or retirement.

Source: The Supply of Health Manpower, 1970 Profiles and Projections to 1990, U.S. Department of Health, Education and Welfare, December 1974, chapter 10.

All projections for future supply of registered nurses estimate that both the number of registered nurses and active registered nurses, as well as the ratio of nurses per 100,000 population will increase both in California and the nation. (See Tables V-3 and V-4). It can be estimated that the number of active registered nurses will increase by 3.44% in California from 1975 to 1990; while the per population ratio will increase from 434 per 100,000 to 541. In comparison the total number of active registered nurses in the U.S. has been projected to increase by 64.91% in the period 1975 to 1990; while the per population ratio will increase from 414 active R.N.'s per 100,000 population to 585. Now it can be seen that California, which in 1975 is shown to have more active nurses per 100,000 population than the national average, by 1980 will fall steadily behind the projected national average ratio. Similarly, the percentage growth in the nurse supply in California by 1980 will be lower than the national average growth percentage.

TABLE V-4
BASE CASE ESTIMATED TOTAL LICENSED AND ACTIVE R.N.s IN CALIFORNIA IN 1975, 1980, 1985 AND 1990

	1975		1980		1985		1990	
	Number	%	Number	%	Number	%	Number	%
Total licensed RN	137,316		163,466		190,225		212,773	
Active RNs	92,161	100	109,949	100	127,137	100	141,420	100
Surviving and licensed, 1975 RNs			80,117	72.9	69,445	54.6	57,938	41.0
Migrating RNs 1976-1990			11,500	10.5	22,303	17.6	32,323	22.0
Calif. graduates, 1926-90			18,332	16.6	35,389	27.8	51,159	36.2
Calif. pop. (thousands)	21,206		22,659		24,363		26,098	
Active RNs per 100,000	434		485		521		541	

SOURCE: Migration and the Supply of Health Manpower in Calif., James Del Rossi.

This may in part be attributed to the differential in the projected growth rate of the population in California and in the nation. As shown in Tables V-5 & V-5a , it has been estimated that the percentage of population growth in California and in the nation will decrease in the next fifteen years, while the percentage of nursing growth will increase. However, California's population has been estimated to grow at a greater percentage than the average national growth percentage, while the growth percentage of active nurses in California is projected as being smaller than the average percentage of growth of active nurses in the nation.

TABLE V-5
CALIFORNIA AND U.S. POPULATION PROJECTION AND PERCENTAGE OF GROWTH RATE

Series D-100	Population Projection	Population Growth	% of Growth	Population Projection	Population Growth	% of Growth
1975	21,206	--	--	214,883	--	--
1980	22,659	1,453	6.9	226,934	12,051	5.6
1985	24,363	1,704	7.5	239,329	12,395	5.5
1990	26,098	1,735	7.1	250,639	11,301	4.7

Computed by the Health Manpower Study from population data for June 1974 from "Projections for California Counties, 1975-2000", California Department of Finance.

TABLE V-5a

GROWTH PERCENTAGE AND POPULATION RATIO (PER 100,000 POPULATION) DIFFERENTIAL OF ACTIVE NURSES IN CALIFORNIA AND THE U.S.

1965 - 1975

	California	U.S.
Growth Percentage of Active Nurses	+35.04%	+43.22%
Ratio Difference of Active Nurses per 100,000 pop.	+66 nurses (368 - 434)	+95 nurses (319 - 414)

1975 - 1990

	California	U.S.
Growth Percentage of Active Nurses	+52.83%	+64.91%
Ratio Difference of Active Nurses per 100,000 pop.	+107 nurses (434 - 511)	+171 nurses (414 - 585)

In a special conference on health manpower at the White House in November 1975, it was recognized that the "increase in the number of nurses in the next 10 to 15 years is expected to outpace population growth."(5) Part of the reason is due to the decreasing percentage of population growth. The White House conferees questioned, however, if the increase in manpower supply would still be adequate to meet the nation's needs. (Their requirements will be discussed in the chapter on Demand.)

NURSING PROGRAM DATA

As stated above, it can be said that the primary factor establishing the supply of nursing personnel is the availability of educational resources(1) -- that is, the programs which train nurses and the number of their successful graduates. The education of registered nurses is unique from that of other health professionals in that although there is only one type of R.N. licensure, and only one nursing licensing board in California which grants the R.N. license to those passing the licensure test, there are three distinct kinds of training programs--the two-year Associate degree nursing program, the three-year Diploma nursing program, and the four-year Baccalaureate degree program. In addition, Master and Doctoral degree programs are available to the registered nurse for increasing skills and specialization.

Programs

The increase in registered nurse supply in California has occurred as a result of the development of two-year nursing programs, according to some sources.(1) Growth has been dramatic for these academic institution-based programs in terms of number of programs as well as enrollment. The Baccalaureate degree program also is experiencing growth, whereas Diploma programs have gradually declined. Graduate nursing programs for M.A. and Ph.D. degrees in nursing are also slowly increasing. Table V-6

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shows the growth of accredited programs for 1965 to 1975 in California. A list of the accredited pre-service programs in California in professional nursing appears in Appendix B on page B-1.

Table V-6 below, also indicates that hospital-based Diploma training programs are rapidly being phased out. This is due mainly to cost pressures on hospitals. It has also been a result of the response to Federal programs in nursing education which gave public support to academic institutions to develop nursing programs in the late 1950's and 1960's (this support in the 1970's has been moderated due to concern of health planners and educators of possible oversupply of nurses, and has been reflected in the increasing restrictions and difficulties to obtain capitation grant monies. For a variety of reasons, "California has been a leader in the transition of Diploma-oriented hospital-based programs to Associate degree programs."(1)

TABLE V-6

TOTAL NUMBER OF ACCREDITED NURSING PROGRAMS IN CALIFORNIA

1965 - 1975

	1965	1975
Associate Degree	32	60
Diploma	20	5
Baccalaureate	15	24
Graduate (M.S.N., Ph.D.)	2	9
TOTAL	69	98

SOURCE: Compiled from data submitted to the Health Manpower Study Office, Spring 1976.

The table above includes pre-service nursing programs, as well as 7

B.S. or B.A. programs in four-year postsecondary educational institutions which are open only to active registered nurses who do not have a Baccalaureate degree in nursing. These programs have been developed in just the past few years and differ widely in format. Some are sponsored by accredited nursing schools and conducted on-campus for the experienced active nurse who wishes to get a Baccalaureate degree. Most of these programs for active nurses, however, are conducted through "extended university programs." Here, classes are held off campus, and the course work may or may not be taught by faculty of the accredited nursing school. In one B.S. degree program for experienced nurses, the liberal arts courses are taught by letters and science faculty of the sponsoring university. In another such program offering a BSN for active nurses, students follow individually designed curriculums, monitored monthly by the program coordinator from the sponsoring school of nursery. These programs allow participation from nurses working and living in isolated rural areas.

The popularity of the Baccalaureate programs is due somewhat to the urging of groups such as the National Consultant Group on Nursing "to increase the number of nurses with advanced training who are capable of assuming educational and administrative leadership roles."(1) Tied to this also is the proposal of groups such as the American Nurses Association to change the present single nursing career structure into separate technical and professional career fields. According to M.W. Searight, "Professional nursing begins with the Baccalaureate degree and mastery of content not commonly taught in Associate degree and Diploma programs."(2) Many R.N.'s see the B.S. degree in nursing as a way to move up the promotional and salary ladder of their employer institutions, as well as a way to increase job satisfaction with more meaningful responsibilities.

Studies on actual nurse administrator selection criteria, however may refute this perception.

Graduate nursing programs beyond the B.S. degree have also been experiencing enthusiastic response from nurses wishing to become specialists, although the programs themselves have developed slowly due to funding and licensing problems. Many of the new specialist programs have been funded by federal grants, mainly from agencies of HEW such as the Regional Medical Programs (whose functions will eventually be taken over by the newly developing health systems agencies of the health planning Act of 1976, P.L. 930641.) Legally, the practice of the nursing specialists, who expanded their role beyond those covered in the Nurse Practice Act was covered under the Experimental Health Manpower program of the California Department of Health until 1975 when the Nurse Practice Act was broadened. By law, the Board of Registered Nurses and the new Board of Medical Quality Assurance are jointly empowered to promulgate guidelines for standardized procedures for nurses engaged in expanded roles of nursing, but these guidelines to date have been delayed.(11)

In 1973, some 700 nurse practitioner students and graduates in formal programs were identified; by May of 1975, some 1,978 nurse practitioner students and graduates were identified. Donna Ver Steeg, notes that, "this rapid increase of nurse practitioners is in marked contrast to the physician's assistants programs which, by mid-1975 had produced approximately 100 practicing physician assistant graduates under the authority of the Board of Medical Examiners." (11)

TABLE V-7
NUMBER AND PERCENT OF NURSE TRAINEES IN EMPLOYMENT/UTILIZATION
Since Start of Program Through May 1975

HEALTH FIELD (Trainee Role)	TRAINEES TOTAL		CALIFORNIA		OUT OF STATE		NOT EMPL/UTIL OR UNKNOWN	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
NURSING	1,761	100.0	1,145	65.0	254	14.4	362	20.6
Family Nurse Practitioner	553	100.0	328	59.3	28	5.1	197	35.6
Pediatric Nurse Practitioner	417	100.0	291	69.8	39	9.4	87	20.9
Maternal Nurse	559	100.0	343	61.4	164	29.3	52	9.3
Nursing Midwife	14	100.0	9	64.3	5	35.7	0	--
School Nurse	86	100.0	80	93.0	0	--	6	7.0
Geriatric Geriatric Nurse	1	100.0	1	100.0	0	--	0	--
Family Planning Nurse	131	100.0	93	71.0	18	13.7	20	15.3

SOURCE: Second Annual Report to the Legislature, State of California and to the Healing Arts Licensing Boards; November 30, 1975, Page 42.

Table V- 7 shows the number and percent of nurse practitioner trainees in employment/utilization since the start of the programs through May 1975.

Nurse specialists in other fields such as emergency room care, intensive care, coronary care, peri-natal and pre-nursery care are often employed nurses who participate in special continuing education and training programs certified by recognized trainers, but usually are not accredited for any advanced degree by a postsecondary educational institution.

TABLE V-8

REGISTERED NURSES EMPLOYED FULL TIME IN SPECIAL UNITS OF INSTITUTIONS BY TYPE OF UNIT AND NUMBERS OF UNITS IN CALIFORNIA

Calif. FTA Study Specialty Unit	Full Time RNs	%[1]	Calif. Hospitals Specialty Unit	No. of Hospitals	%[2]
TOTAL	4,789	100.0		579	
Intensive Care	1,235	35.8	Intensive Care	na	na
Pediatric ICU	507	10.6			
CCU-ICU	986	20.6	Mixed	415	71.7
Coronary Care	771	16.1	Cardiac	201	34.7
Cardiac Surgery	72	1.5	Open Heart Surgery	66	11.4
Psychiatric			*Psychiatric		
Adult	375	7.8	Inpatient	104	18.0
Children	22	0.5	Outpatient	110	19.0
Substance Abuse	105	2.2	Special Services		
Burn Unit	72	1.5	Burn Care Unit	18	3.1
Respiratory	104	2.2	*Renal Dialysis		
Renal Dialysis	189	3.9	Inpatient	87	15.0
Kidney Transplant	7	0.1	Outpatient	74	12.8
Rehabilitation			*Rehabilitation		
Adult	161	3.4	Inpatient	44	7.6
Children	7	0.1	Outpatient	63	10.9
Cardia Cath Lab	15	0.3			
Oncology	3	0.1			
Trauma	11	0.2	*Emergency Dept.	425	73.4
Critical Care	141	2.9			
Research	6	0.1			

[1] Percent of R.N.s Employed Full Time in Specialty Units

[2] Percent of Total Hospitals with Specialty Unit

*Related data but not exactly comparable.

SOURCE: California FTA Study, Department of Health, February 24, 1976 (1974 data)
Hospital Statistics, American Hospital Association, 1974 (1973 data)

Table V-8 shows the number of registered nurses actively employed full time in special units of institutions by type of unit and number of units in California.

One way to smooth the transition of records, students and educational resources between all these various levels of nursing training programs is with planned articulation. Articulation is the coordination of programs and curriculums in higher education institutions allowing for easy transfer of students from one program to another; articulation for California nursing programs has not been perfected. Agreements between various four-year academic institutions, such as in the extended degree programs described above, have been a result of individual initiative, not coordinated planning. The California system of public higher education could be an ideal system to accomodate articulation.(1) Problems such as the terminal tradition of community college programs, are changing with time and should make coordinated programs and articulated career ladders possible to obtain, especially in the nursing field. Without recognized accreditation, however, nurse specialists in particular are beginning to experience difficulties with educational and professional advancement, despite their advanced training.(11)

In sum then, there are presently 98 formal programs in California postsecondary institutions and numerous informal continuing education programs which train registered nurses. This number has been growing and there are many indications that even more programs are being planned. The California State University and Colleges had in its Academic Program Plan of April 1975, projections to develop in 1976 one more Baccalaureate program and three more Master of Science programs in nursing. Two

TABLE V-9

CALIFORNIA SCHOOLS OF NURSING

R.N. ADMISSIONS & GRADUATES 1968-1975

Year	Admissions				Graduates			
	Associate	Diploma	Baccalaureate	Total	Associate	Diploma	Baccalaureate	Total
1968 % Inc.	2384 +11.2	779 - 2.5	1040 + 1.2	4203 + 5.2	1179 +24.1	556 - .6	583 - 1.9	2318 + 7.3
1969 % Inc.	2496 + 4.7	738 -10.6	1258 +21.0	4492 + 6.9	1395 +18.3	588 + 5.8	643 +10.3	2626 +13.3
1970 % Inc.	3025 +15.2	595 -19.4	1613 +28.2	5233 +16.5	1773 +27.1	503 -14.5	735 +14.0	3011 +14.7
1971 % Inc.	3502 +15.8	645 + 8.4	1647 + 2.1	5794 +10.7	1896 + 6.9	492 - 2.2	914 +24.3	3302 + 9.7
1972 % Inc.	3630 + 3.7	569 -11.8	1813 +10.1	6012 + 3.8	2386 +25.8	491 - .2	1015 +11.1	3892 +17.9
1973 % Inc.	3608 - .6	482 -15.3	1280 -29.4	5370 -10.7	2552 + 7.0	369 -24.8	1018 + .3	3939 + 1.2
1974 % Inc.	4066 +12.6	388 -19.5	1446 +12.9	5900 + 9.8	2886 +13.0	384 + 4.0	1253 +23.0	4523 +14.8
1975 % Inc.	4350 + 7.0	355 - 8.5	1695 +17.2	6400 + 8.5	3126 + 8.3	374 - 2.6	1385 +10.5	4885 + 8.0
Total % Increase 1968-75	+82.5	-54.4	+63.0	+52.2	+165.1	-32.7	+137.6	+110.7

Source: California Board of Nurse Education and Nurse Registration

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community colleges in the State also plan to develop nursing programs in 1976.(4)

Enrollment

At present, as in the past, there continues to be a surplus of applicants for all levels of registered nursing training programs in California, including many who already have college degrees in other fields, including some at the Master's level.(1) This is due to a variety of factors, but largely to the public's perception that there is a shortage of nurses everywhere and that therefore employment opportunities everywhere for nurses are good.

Table V-9 shows the increase of nursing programs admissions and graduates in California since 1968. A breakdown of nursing degrees conferred in each California State University and College as well as the University of California can be found in Appendix B; pages B-5 and B-6. As seen in the table, enrollment has increased in all programs but the Diploma, as has the number of graduates from nursing programs in California. The chart also shows that the Associate degree programs have had the greatest increase in number of graduates with the Baccalaureate programs not far behind. According to one study, the growth of R.N. graduates in all levels of programs is greater in California than in the U.S. as a whole, but the growth in graduates from Associate degree programs in California, while dramatic, is half the average national growth rate of A.A. degree programs.(3)

Table V-9 also shows that admission of students in the Associate and Baccalaureate degree programs increased steadily until 1973, when all programs experienced a sudden decrease in admissions, and then grew again in 1974 and 1975. Diploma programs of course show a continual decrease

TABLE V-10

SOURCE OF NEW REGISTERED NURSE LICENSEES: SELECTED YEARS, 1960-1974

		California Graduates		Other States and Countries			
Year	New Licensees	No.	Percent of new Licensees	Other States	Foreign Countries and Canada	Total	Percent of New Licensees
1960	6395	1185	19	4551	655	5206	81
1962	6641	1239	19	4420	982	5402	81
1964	7265	1441	20	4584	1240	5824	80
1967	7513	2197	29	3270	2046	5316	71
1969[a]	8618	2586	30	5101	931	6032	70
1970	8423	2988	35	5004	431	5435	65
1971	8132	3265	40	4215	652	4867	60
1972	9131	3640	40	4039	1452	5491	60
1973		3902					
1974	11522	2897	25	5578	3047	8625	75
1975	*12039						

*5,604 by endorsement; 6,435 by examination

SOURCE: California Board of Nurse Education and Nurse Registration in admissions rate as one Diploma school after another closes its doors.

"Future California supply of R.N.'s then is quite sensitive to the rate of growth in educational output," according to Dei Rossi.(7) Each percentage increase in the growth rate (relative to the base case rate) produced about a 1.5% increase in the number of R.N.'s per 100,000. In this way also, the 3.5% increase in the ratio that would make the 1985 California ratio equivalent to the 1985 U.S. ratio, implies almost a 30% increase in the level of graduate output by 1985 (thus each percentage change in the 1985 ratio corresponds to about an 8% change in output).(7)

TABLE V-11

SENSITIVITY OF FUTURE R.N. SUPPLY TO FUTURE CALIFORNIA EDUCATIONAL OUTPUT

	Change In Growth Rate	1985 California Graduates		Active R.N.'s per 100,000	
		Number	Change	Number	Change
Base Case		5,396		521	
Alternative #1	+2.5%	6,910	+28%	540	+3.5%
Alternative #2	+5.0%	8,972	+63%	561	+7.7%

MIGRATION

California is still a debtor state in nursing. From Table V-11 it can be seen that some 75% of new California nursing licenses in 1974 were obtained by nurses who had been trained outside of the State. In 1960, 81% of the new registered licensees came from other states or foreign countries; this percentage had gradually declined to 60% by 1972, and then suddenly shot up to 75% in 1974. (This increase could be due to the improved ability of foreign immigrants to take the nursing licensure

TABLE V-12

ESTIMATED R.N.'s MIGRATING TO CALIFORNIA BETWEEN 1976 AND 1990 USING BASE CASE MIGRATION RATE

Age	1980	1985	1990
Under 25	2,236	2,329	2,365
25 to 34	8,015	14,956	17,526
35 to 44	3,409	8,939	16,267
45 to 54	1,326	3,164	6,287
55 to 64	511	1,393	2,730
65+	49	208	621
TOTALS	15,546	30,989	45,796

TABLE V-13

SENSITIVITY OF FUTURE CALIFORNIA R.N. SUPPLY TO FUTURE IN-MIGRATION

	In-Migration		1985 Active R.N.s per 100,000	
	Rate	Change	Number	Change
Base Case	.046		521	
Alternative 1	.042	(-)10%	513	(-)1.5%
Alternative 2	.035	(-)25%	499	(-)4.2%
Alternative 3	.023	(-)50%	476	(-)8.9%

TABLE V-14

Table SENSITIVITY OF FUTURE CALIFORNIA R.N. SUPPLY TO THE RETENTION OF CALIFORNIA GRADUATES

	California Graduate Retention		1985 Active R.N.s per 100,000	
	Rate	Change	Number	Change
Base Case	.988		519	
Alternative 1	.950	(-)3.8%	516	(-)1.2%
Alternative 2	.900	(-)8.9%	508	(-)2.5%

examination, which was instituted in 1967 and probably accounted for some of the decline in percentage of inmigration in the late 1960's.) Inmigration from other states has shown no particular pattern of increase or decrease to date.

Table V-12 shows the estimated total number of R.N.'s migrating to California, who will both survive and retain licenses in 1980, 1985, and 1990, using the methodology described in Appendix D, page K-1. It has been estimated that some 12,267 R.N.'s inmigrated to California from 1967 to 1973 (almost 5% of the total nursing graduates in the nation.)(8) Table V-12 projects the number of R.N.'s who will migrate to California in 1980, 1985 and 1990 who will both survive and retain their licenses; as is apparent the number doubles every five years!(8).

It has been found that a change in this rate of inmigration however, would produce little effect on the total supply of nurses.(7) Statistics show that future supply of nurses is relatively insensitive to changes in the assumed rate (4.6% of the total number of nurses trained in the U.S. each year) of inmigration. It was found that a full 50% decrease in the inmigration rate produces less than a 9% change in the ratio of R.N.'s per 100,000 population. (See Table V-13)

The board of Nurse Education and Nurse Registration records the number of nurses who received endorsements from other states (although some of those nurses who receive endorsements do not actually leave the State). It can be seen in Table V-15 on the next page, that these endorsements have been increasing, which slightly affects the statistic for inmigration. Similarly, from past trends it was derived that the retention rate for California nursing graduates was 98.8%.(See Table V-14)

TABLE V-15
REGISTERED NURSE MIGRATION: 1969 - 1974

Year	Immigration			Endorsements to Other States	Net Immigration[a]	
	Other States	Foreign	Total		Total	Percent of New Licensees
1970	5004	431	5435	1883	3552	42
1971	4215	652	4867	1997	2870	35
1972	4039	1452	5491	2078	3413	37
1973				2161		
1974	5578	3047	8625	2397	6228	54

SOURCE: Board of Nurse Education and Nurse Registration

Yet it has been found that a decrease in this retention rate (as with an increase in the immigration rate) would also have little effect on the overall supply of nurses.(See Table V- 13, previous page)

Again, as stated earlier, the one real effect on supply seems to be the output of educational institutions and programs, although from a practical standpoint, there is no indication that California needs to become self-sufficient in producing registered nurses in order to be assured of an "adequate" supply.(1)

NURSE LABOR FORCE PARTICIPATION

A major problem in attempts to identify the supply of nurses is that there are a great many trained R.N.'s who choose not to seek employment at a given time, writes Charles A. Pillsbury.(1) In Table V-1, it can be seen that of a total of 137,316 registered nurses, only 92,161 were active or 67%. In fact, in Table V-1 it can be readily seen that for the past ten years, less than 70% of all registered nurses in California were actively employed. This attrition can be seen even during nursing training. Table V- 9 on page shows that in 1973, for instance (the latest year for which there is coresponding data): 3,608 person were admitted to California A.A. degree nursing programs; 3,126 persons graduated two years later; and a loss of 12%. This same table shows that in 1973 a total of 5,370 nurses graduated from nursing programs in California and, that year, only 3,902 obtained licenses, a loss of 1,468 or 27%.

Much of this early attrition can probably be attributed to changing life plans and expectations for careers. It could also indicate the lack of good career education and an inefficient selection process. No comprehensive study of early attrition factors has been identified.

A fairly complete study which projects nurse supply by considering attrition factors such as age distribution, probability of survival, and the probability of retaining a license shows an interesting pattern; the chances of those nurses between the ages of 45 and 64 retaining their licenses (and thus remaining active in the nursing field) are as great or greater than the chances of new graduates under 25 years of age. The age group which has the highest probability of not retaining their licenses are, number one, of course the 65-year olds and older and the 35 to 44 year old age group. Also low is the 25 to 34 year old group, although not as low as the 35 to 44 year group. (See Table V-16).

TABLE V-16

CURRENT SUPPLY OF CALIFORNIA R.N.'s, ATTRITION FACTORS, AND PROJECTION AFTER ATTRITION

Age	1975 R(i,t)	Probability of Surviving (1-d(i))	Probability of Retaining License (1-a(i))	RNs Surviving and Retaining Licenses		
				1980	1985	1990
Under 25	3,158	.9994	1.000	--	--	--
25 to 34	35,153	.9991	.990	19,727	2,922	--
35 to 44	32,681	.9981	.983	31,229	30,387	16,816
45 to 54	33,093	.9953	1.004	31,903	29,375	28,004
55 to 64	22,795	.9898	1.000	27,005	31,487	30,326
65+	10,436	.9656	.970	13,486	16,250	19,788
TOTAL	137,316			123,350	110,421	94,934

SOURCE: "Projected Supply and InMigration of Registered Nurses", James Dei Rossi.

Labor Force participation then is a critical factor affecting the supply of nurses. Some studies and projects in various parts of the U.S. supported by the Federal government have addressed this problem, principal causes of the low labor force participation were ranked in a study conducted in 1971.(3) Family responsibilities and time considerations are the reasons cited most often for inactivity. (See Table V- 17). Choice of working hours, refresher training and availability of child care facilities are shown in Table V -18 to be the most often cited prerequisite to induce inactive nurses to return to the labor force. Results of federally funded projects dealing particularly with refresher courses, are not available (although experience with such a project in Oklahoma and Missouri indicate limited success: a program which retrained some 6,000 nurses in Missouri in 1968-1969 found that only about 60 remained working six months later, even though child care facilities had been provided in the employment setting.)(10) Obviously, this problem is a subjective one with multiple factors influencing the decision of each individual whether to work or not.

Part-time work (less than 35 hours a week) is also a key issue in regard to nurse labor-force participation. Many inactive nurses express substantial interest in part-time work.(3) No survey of the preference of California inactive nurses for part-time work is known at this time, but it seems evident that defining the supply of nurses in California necessitates examining not only the supply of trained, qualified and licensed individuals, but also the proportion of these (especially inactive nurses) who are willing to seek employment at a given time.

DISTRIBUTION OF NURSES

A final element which should be considered in the supply of nurses in California is the distribution of nurses, both geographically and by specialty. Even though statewide and even county-wide nurse-to-population ratios fail to adequately account for the distribution of personnel within special geographic and specialty areas of need, at this point it is the best tool of comparison. Thus, it can be stated that California follows the national

TABLE V-17

REASONS INACTIVE REGISTERED NURSES DO NOT SEEK EMPLOYMENT

Reason	Percent of Responses by Inactives
Family needs	64.0
Need for refresher courses	20.0
Hours	13.0
Husband opposed	11.8
Health	8.3
Age	6.1
Low salary	5.4
Transportation	4.6

SOURCE: Report of the Health Manpower Project, Massachusetts Nursing Association, 1969.

TABLE V -18

PREREQUISITES FOR INACTIVES TO RETURN TO NURSING

Condition	Percent of Inactives Selecting Item
Choice of working hours	34.5
Refresher training	32.6
Child care facilities	28.4
Change in husgand's attitudes	8.0
Help in transportation	4.7
Housing subsidy	1.4
Higher salary -- write in	1.1

SOURCE: The New York City--Rand Institute, Survey of Inactive Nurses In New York City, April 1971 (unpublished).

trend where areas tend to have a surplus of qualified individuals at all levels of nursing, whereas rural areas tend to have shortages.(1)

In studying the mobility of trained nurses, it has been found that the majority of nurses do not move nor do they wish to move once they have established a home and a family.(11) Those found to be most willing to move are: 1) nurses employed less than one year, 2) males, 3) the currently unmarried, 4) those with no children under eighteen, and 5) those whose income is primarily from nursing. Nurses with school-aged children are less likely to move than those with children under six years of age.

Movement away from the location of the R.N.'s nursing school is substantial, on the average, and takes place soon,though not immediately, after graduation from schools in underserved as well as in adequately served and over-served areas. Ver Steeg notes that very few California graduates move out of state, while almost all students coming from out of state to train in Baccalaureate programs tend to stay in California. There have been indications that among nurses who move, Baccalaureate graduates are more likely to be geographically mobile than Associate degree graduates; this may be due to their better employment opportunities because of their better training. Baccalaureate graduates also have been found to be somewhat more willing to work in small communities and poor metropolitan areas if they did not already live there than were A.A. and Diploma graduates.(11)

TABLE V- 19

REGIONAL TOTAL REGISTERED NURSE-POPULATION RATIOS

Regional Areas[a]	1965		1967		1968		1970		1975	
	Total RNs	Ratio	Total RNs	Ratio	Total RNs	Ratio	Total RNs	Ratio	Total RNs	*Ratio
North Coast	890	473	883	466	929	497	811	499	1,245	619
North Bay	2,571	612	2,836	642	2,978	660	3,147	669	4,279	816
San Francisco Metropolitan	21,064	716	22,460	742	22,854	747	23,362	755	26,034	822
South Bay	6,754	675	7,511	698	7,886	704	8,313	700	10,204	747
Northeast Mt.	831	453	884	466	837	440	944	488	1,326	635
Central Mt.	260	552	281	552	290	553	334	608	434	641
Southeast Mt.	92	500	103	528	109	551	107	498	128	506
Sacramento Valley	1,029	422	1,086	429	1,120	443	1,127	446	1,440	534
Sacramento Metropolitan	4,334	539	4,605	557	4,817	579	4,967	578	6,140	648
San Joaquin Valley	6,045	381	6,441	394	6,677	405	6,853	406	8,391	479
Central Coast	4,513	512	4,968	520	5,296	548	5,602	555	7,118	671
Los Angeles Metropolitan	29,059	494	41,624	509	43,088	520	44,329	521	52,230	605
San Diego Metropolitan	5,884	499	6,588	524	7,099	543	7,559	539	10,297	655
Southeast	5,112	460	5,617	482	5,956	501	6,202	500	7,950	603
Total	98,438	532	105,887	550	109,936	562	113,811	564	137,216	647

SOURCE: Health Manpower Council of California, Registered Nurses updated with information from Profile of Nurses 1970, Board of Nurse Education and Nurse Registration.

*Computed from Department of Finance population data.

Regional areas are the same as those listed in the LVN table.

Table V-19 shows the distribution of registered nurses in various California regional areas over the past ten years. While all areas have increased both the total number of registered nurses and the ratio of nurses per hundred population, there is still wide differences between regions. San Joaquin Valley continues to be the region with the lowest per population ratio of nurses and the San Francisco Metropolitan area continues to be the region with the highest ratio with a difference of 42% between them in 1975 (as compared to a difference of 47% in 1965).

TABLE V-20
REGISTERED NURSES IN CALIFORNIA BY COUNTY

TYPE--Registered Nurses 12/30/75

Alameda	7,088
Alpine	1
Amador	95
Butte	771
Calaveras	94
Colusa	61
Contra Costa	4,805
Del Norte	79
El Dorado	293
Fresno	2,423
Glenn	90
Humboldt	648
Imperial	248
Inyo	96
Kern	1,477
Kings	257
Lake	162
Lassen	94
Los Angeles	40,786
Madera	165
Marin	2,766
Mariposa	49
Mendocino	356
Merced	443
Modoc	48
Mono	32
MOnterey	1,448
Napa	1,101
Nevada	237
Orange	11,444
Placer	576
Plumas	80
Riverside	3,056
Sacramento	4,652
San Benito	79
San Bernadino	4,646
San Diego	10,297
San Francisco	6,391
San Joaquin	1,713
San Luis Obispo	902
San Mateo	4,984
Santa Barbara	1,966
Santa Clara	9,070
Santa Cruz	1,134
Shasta	623
Sierra	12
Siskiyou	181
Solano	1,134
Sonoma	2,044
Stanislaus	1,147
Sutter	248
Tehama	136
Trinity	51
Tulare	766
Tuolumne	195
Ventura	2,723
Yolo	619
Yuba	134
Out of state	31,165
Out of country	2,394
Prefix Count	170,775

SOURCE: Board of Nursing Education and Nurse Registration.

Table V-20 shows the actual raw number of registered nurses per county in 1975. Health Manpower planners have been concerned about the best way to determine adequate nursing supply in a community and to determine if an area should be deemed "underserved" or as having a "critical" manpower shortage. Sophisticated methods have been suggested such as correlating manpower/facility data, mortality/morbidity rates and utilization factors such as transportation time; to date however, shortage and critical shortage areas have been determined by nurse per population ratio.

TABLE V-21
HIGHEST DEGREE BY COUNTY OF EMPLOYMENT OF CALIFORNIA NURSES IN PHYSICIAN-CRITICAL AND PHYSICIAN UNDERSERVED AREAS

	COUNTY	TOTALS	UNKNOWN	ADN	DIPLOMA	BACCA-LAUREATE HEALTH	BACCA-LAUREATE OTHER	MASTERS HEALTH	MASTERS OTHER	DOCTORAL
	California	164,000	2,803	20,154	97,906	28,606	6,686	5,814	1,538	343
CRITICAL	Alpine	3	--	--	--	3	--	--	--	--
	Del Norte	46	--	--	30	6	1	--	--	--
	Glenn	33	1	3	22	4	1	2	--	--
	Imperial	175	2	54	86	20	7	4	2	--
	Kern	955	4	221	477	158	40	41	10	4
	Kings	172	2	18	104	39	5	4	--	--
	Merced	254	--	29	178	37	4	6	--	--
	Modoc	27	--	4	16	7	--	--	--	--
	Mono	12	--	1	8	3	--	--	--	--
	San Benito	41	1	5	28	5	2	--	--	--
	Solano	686	1	107	424	113	14	24	3	--
	Sutter	142	2	13	81	37	6	3	--	--
	Tehama	79	--	17	50	11	1	--	--	--
	Tulare	532	4	126	255	108	21	9	--	--
UNDERSERVED	Amador	43	1	4	33	4	--	1	--	--
	El Dorado	134	3	19	85	24	2	1	--	--
	Fresno	1,736	12	338	720	518	56	74	13	5
	Inyo	71	1	9	45	14	--	--	2	--
	Lake	62	--	11	41	7	1	1	1	--
	Monterey	965	6	159	553	195	35	17	--	--
	Riverside	1,657	16	400	930	103	73	34	8	3
	San Bernadino	3,067	30	859	1,316	554	148	139	15	6
	San Joaquin	1,159	15	320	643	105	28	34	8	6
	Sierra	2	--	--	1	--	--	1	--	--
	Siskiyou	79	1	5	57	13	3	--	--	--
	Trinity	21	--	1	13	6	1	--	--	--
	Tuolumne	104	--	17	69	13	3	2	--	--
	Ventura	1,687	12	326	972	280	59	44	14	--
	Yuba	93	--	8	67	18	3	1	1	--

SOURCE: Paper submitted by Donna Ver Steeg "California Nursing Service and Education: Some Implications for the Allocation of Resources".

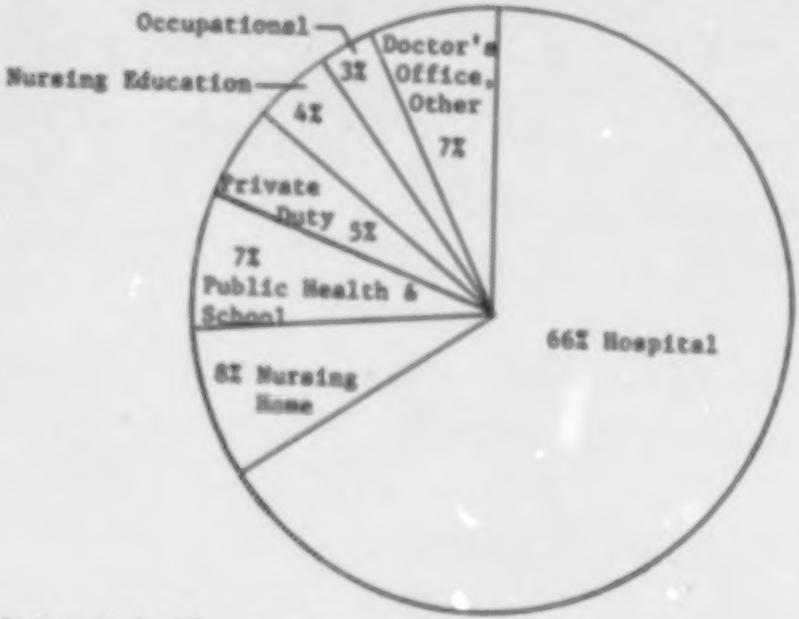
Table V-21 shows nurses with various degrees and where they are located in those counties designated as "critical" and "underserved" health manpower shortage areas in California.(11)

According to one study, the single largest reason for refusing employment in rural areas and poor sections of central cities was that the spouse would oppose it. The second largest reason in rural areas was transportation time; in central city areas, personal danger was ranked as the most often cited reason for refusing employment, with transportation time and poor schools placed about equally behind.(11) In areas where there seems to be an adequate supply of trained nurses, there still may be vacancies in shift work, in specialties like operating room or gynecological nurse or in less desirable employment sites like convalescent homes. "The problem is not only one of getting trained people to the areas, but one of getting people already there to work, especially to get them to work in the less desirable facilities and at less desirable hours."(1)

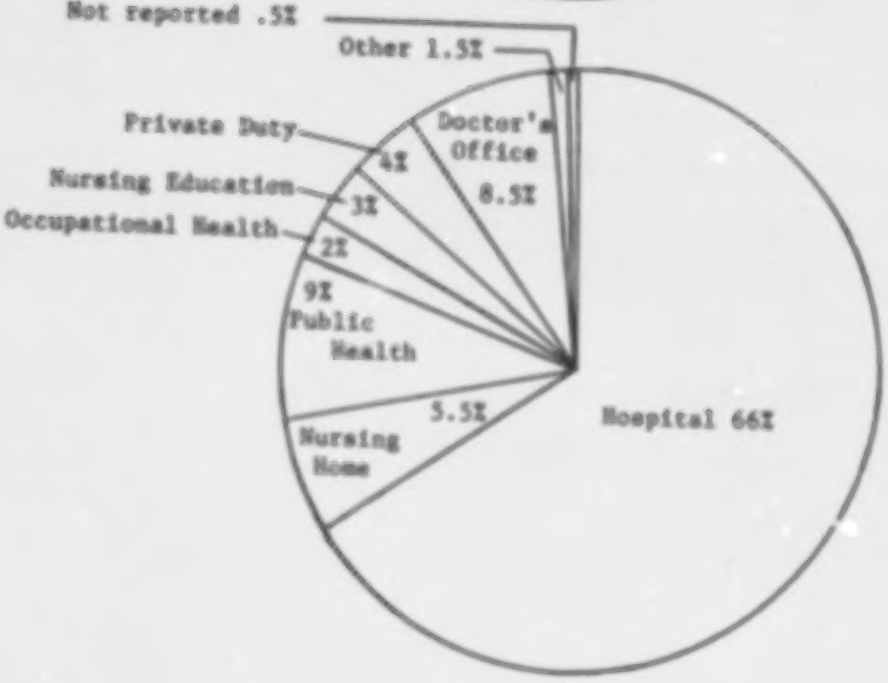
There are some indications that employers are less quick to fill vacancies with "any old trained nurse" but are willing to take time to look for a person with higher relative qualifications. The clinical training of A.A. degree personnel is often cited as a problem by acute care facility employers who sometimes would rather wait for a more clinically trained applicant. The same is true of facilities requiring nurses with postgraduate specialized training.

TABLE V-22

REGISTERED NURSES BY FIELD OF EMPLOYMENT IN THE U.S. AND CALIFORNIA, 1972



U.S. -
780,000 NURSES



CALIFORNIA -
68,118 NURSES

Source: Source Book, Nursing Personnel, U.S. Department of Health, Education, and Welfare, December 1974.

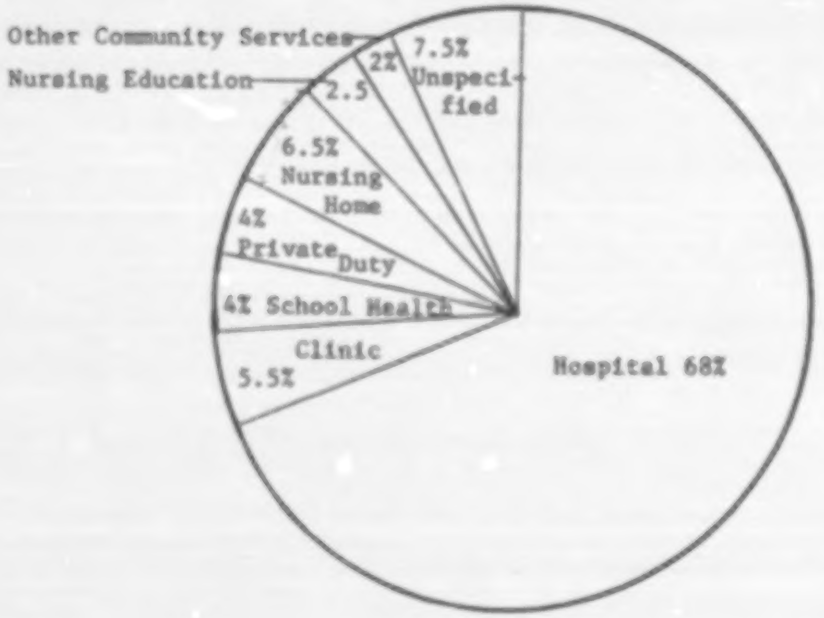
Figures rounded to nearest ½ percent.

Table V-22 shows the distribution of active registered nurses in California and in the nation by field of employment. The needs for particular specialists will be covered in the Demand section of this report. It is interesting to note that California follows about the same distribution pattern as the rest of the nation as a whole. Some two-thirds of all active nursing professionals are practicing in in-bed hospitals and other types of institutions while the rest are thinly distributed over a wide range of nursing fields. This should be examined in the light of current emphasis on health maintenance and prevention of illness, the shift from institution nursing to community nursing and care of the sick in the home instead of in institutions. The new California Nurse Practice Act reflects some of these changes which are making new demands of the supply of nurses presently available. These points will be covered in the next chapter in this report.

Table V-23 provides similar information for California nurses' places of employment for 1975. Comparable data is not available for the U.S. as a whole.

TABLE V-23

REGISTERED NURSES BY FIELD OF EMPLOYMENT IN CALIFORNIA, 1975



Total Nurses - 92,161

Figures rounded to nearest ½ percent.

Source: Compiled by the Health Manpower Study Office from figures provided by the California Department of Health, FTA Study.

TABLE V-24

TOTAL LVN, LICENSESS, ACTIVE LVN'S, AND RATIO TO POPULATION: 1961 - 1975

Year	Population	Total LVN's	Ratio per 100,000 Population	Active LVN's	Ratio per 100,000 Population
1961	16,369,000	15,980	97.6		
1962	16,912,000	17,115	101.2		
1963	17,533,000	19,428	110.8		
1964	18,041,000	20,004	110.9		
1965	18,516,000	22,740	122.8		
1966	18,879,000	24,505	129.8		
1967	19,261,000	28,480	147.9	21,844	113.4
1968	19,544,000	31,554	161.4		
1969	19,819,000	36,099	182.1		
1970	20,022,000	38,710	193.3		
1971	20,265,000	44,250	218.4		
1972	20,524,000	45,689	222.6	35,180	171.4
1975	21,206,000	54,570	257.3		

SOURCE: Health Manpower Council of California, Licensed Vocational Nurses, Orinda, California, 1970, p.9, updated after 1968 with data from Board of Vocational Nurse and Psychiatric Technician Examiners, and population estimates of the California Department of Finance. 1975 Data updated by Health Manpower Study Office.

SUPPLY OF LICENSED VOCATIONAL NURSES

Vocational nurses care for and treat patients under the supervision of a physician or a registered nurse and may also supervise non-professionals. They are graduates of various kinds of formal programs of at least twelve months duration offered at a variety of private schools, high schools, adult education programs or community colleges. Schools are accredited and graduates are licensed after successfully passing a written licensure examination by the California Board of Vocational Nurse and Psychiatric Technician Examiners. This Board also evaluates and licenses LVN's from other states and foreign countries as well as individuals who pass an equivalency examination in lieu of graduation from a school. It has been noted that most states have consolidated boards which deal with both L.V.N. or (L.P.N.) and R.N. personnel. California has two boards with no formal coordination between them. Legislative proposals have been made to consolidate the two boards in accordance with the recommendation of the National Commission for the Study of Nursing and Nursing Education (AB 1495, Assemblyman Duffy).(1)

Licensure Data

The supply of L.V.N.'s is growing in numbers each year because of the fact that hospitals in an effort to cut health care costs, have begun to hire more L.V.N.'s than R.N.'s because of the lower rates of pay, according to one California Department of Finance source.(1) In 1975, the licensing board recorded a total of 54,570 vocational nurses licensed in California. (See Table V-24). In 1961, there were about six California R.N.'s for every L.V.N.; by 1975, there were about three in terms of actual numbers (not designated active or inactive.) Data on the number of active L.V.N.'s for 1975 is not available; in 1972, it was recorded that there was 171.4 active L.V.N.'s per

TABLE V-25
LICENSED VOCATIONAL NURSES IN CALIFORNIA: JULY 1972 & 1975

Regional Area[1]	1972 LVN's	 Ratio/100,000	1975 LVN's	 Ratio/100,000
North Coast	492	266	605	301
North Bay	1,189	262	1,433	273
San Francisco Metro.	6,172	197	7,038	222
South Bay	1,726	145	2,073	152
Northeast Mountain	568	313	706	338
Central Mountain	250	462	283	418
Southeast Mountain	31	158	46	182
Sacramento Valley	1,012	408	1,187	440
Sacramento Metropolitan	1,809	214	2,295	242
San Joaquin Valley	3,784	233	4,608	263
Central Coast	1,700	168	2,244	196
Los Angeles Metro.	15,449	183	19,701	228
San Diego Metro.	2,882	212	3,727	237
Southeast	2,635	216	3,288	249
Total	39,699	199	49,234	232

SOURCE: Board of Vocational Nurse and Psychiatric Technician Examiners. It should be noted that population estimates used for the year 1972 by the Board are significantly lower than those of 1975 (California Department of Finance Population Research Unit) and therefore the ratios computed are probably slightly higher than if Finance estimates were used for that year.

[1] Counties included in each area:

North Coast: Del Norte, Humboldt, Lake, Mendocino
North Bay: Napa, Solano, Sonoma
San Francisco Metropolitan: Alameda, ContraCosta, Marin, San Francisco, San Mateo
South Bay: Santa Clara, Santa Cruz
Northeast Mountain: Lassen, Modoc, Nevada, Plumas, Shasta, Sierra Siskiyou, Trinity
Central Mountain: Alpine, Amador, Calaveras, Mariposa, Tuolumne
Southeast Mountain: Inyo, Mono
Sacramento Valley: Butte, Colusa, Glenn, Sutter, Tehama, Yuba
Sacramento Metropolitan: El Dorado, Placer, Sacramento, Yolo
San Joaquin Valley: Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare
Central Coast: Monterey, San Benito, San Luis Obispo, Santa Barbara, Ventura
Los Angeles Metropolitan: Los Angeles, Orange
San Diego Metropolitan: San Diego
Southeast: Imperial, Riverside, San Bernardino

100,000 population (this compares to about 396 active R.N.'s per 100,000 population in 1973, about a ratio of two active R.N.'s per one active L.V.N.)

Table V-25 shows the number of L.V.N.'s by regional area and ratio of 100,000 population. As can be seen, both the number and ratio have grown in every region in the past four years. The total growth percentage is 24% from 1972 to 1975 (compared to about an 8% increase in the number of registered nurses between 1973 to 1975.) Although these figures are hard to compare, it can be generally seen that the number of L.V.N.'s is increasing in California at a greater rate than the number of R.N.'s. No consensus on an optimum L.V.N. per population or L.V.N. per R.N. ratio could be found to date.

Enrollment Data

In 1975 the Board of Vocational Nurse Registration and Psychiatric Technician Examiners listed 82 accredited vocational nursing programs in California, graduating a total of 3,064 graduates. In 1968-69, there were a total of 55; and in 1969-70, a total of 28.(1) L.V.N. programs were started only in 1953.(1) No hard data could be found on plans for increasing the number of L.V.N. programs in the future. The development of new programs and expansion of existing programs seems to go on in an unplanned, uncoordinated way; "there has never been effective control over the growth of these educational programs,"(1) but the Board of Vocational Nurse Registration and Psychiatric Techinican Examiners is presently attempting to discourage further proliferation of L.V.N. programs, especially in areas that they already view as being saturated.(1)

According to the State Department of Finance, there will be a surplus of 17,922 full-time employed L.V.N.'s by 1980 who will be involuntarily em-

TABLE V-26

LVN CANDIDATES PASSING EXAM FIRST TIME AND LICENSED BY ENDORSEMENT FROM OTHER STATES: 1960-1975

	California Graduates Passing Exam First Time		Equivalency Passing Exam First Time		Other States			Total Cols. 1 2 and 3	% of Total
Year	No. (1)	Percent of Total (1 of 4)	No. (2)	Percent of Total (2 of 4)	Exam First Time	Endorsement	Total (3)	(4)	(3 of 4)
1960	955	71	63	5	43	281	324	1342	24
1961	1109	65	124	7	53	418	471	1704	28
1962	1009	56	238	13	52	514	567	1814	31
1963	1114	59	107	6	74	591	665	1886	35
1964	1248	60	200	10	51	573	624	2072	30
1965	1475	63	259	11	89	521	610	2344	26
1966	1820	59	472	15	72	726	798	3090	26
1967	1564	48	866	26	81	759	840	3270	26
1968	2024	48	1271	30	96	857	953	4248	22
1969	2270	52	1050	24	125	872	997	4317	23
1970	2470	54	1051	23	105	937	1042	4563	23
1971	2692	58	1007	22	123	814	937	4636	20
1972	2689	66	412	10	96	846	942	4043	23
1973			unavailable						
1974	2624		unavailable						
1975	3177	65	462	9	113	1113	1226	4865	25

SOURCE: Board of Vocational Nurse and Psychiatric Technician Examiners. 1974 and 1975 figures updated by Office of Health Manpower Study with this Board.

ployed. "Obviously, educational facilities as the primary 'constraint' of L.V.N. supply, do not provide the full restriction on growth in the nursing pool needed if these training resources and students' time is not to be wasted. If the rate of production of new L.V.N.'s does not slacken and staffing patterns continue, there will be involuntary unemployment of L.V.N.'s." (1)

Migration

Inmigration of L.V.N.'s has been estimated to be much less than in-migration of R.N.'s.(3) Table V-26 shows the percentage and number of in-migrants since 1960 who passed the L.V.N. examination. Since 1970, the number of L.V.N. in-migrants have averaged about 23% of the total number of L.V.N. candidates passing the licensing examination for the first time (compared to an average of about 68% of new R.N. licensees who were in-migrants from 1970-1974). As with R.N.'s, L.V.N. in-migration peaked in the mid-1960s, decreased sharply with the institution of the licensing examination requirements in the late 60's and 70's, and has in the middle of the 1970's, begun slowly to increase again. Still unlike the supply of R.N.'s in California, it can be seen that the State has never been a "debtor" state in furnishing trained L.V.N.'s to the health manpower pool.

Labor Force Participation

There is little hard data on the labor force participation of L.V.N.'s. According to the State Department of Finance, "the L.V.N. participation rate is higher than that of the R.N. Approximately 77% of all L.V.N.'s in California are employed and of that number, 92% are employed full time."(11) (versus 58% for R.N.'s).(12)

L.V.N.'s also tend to be much less mobile than R.N.'s. This is attributed to several factors including: 1) social-economic status (poor people

TABLE V-27

LICENSED VOCATIONAL NURSES IN CALIFORNIA BY COUNTY

TYPE - VOCATIONAL NURSES 12/30/75

1	Alameda	2,831	31	Placer	282
2	Alpine	1	32	Plumas	46
3	Amador	44	33	Riverside	1,399
4	Butte	574	34	Sacramento	1,699
5	Calaveras	70	35	San Benito	37
6	Colusa	48	36	San Bernadino	1,740
7	Contra Costa	1,319	37	San Diego	3,727
8	Del Norte	29	38	San Francisco	1,621
9	El Dorado	105	39	San Joaquin	979
10	Fresno	935	40	San Luis Obispo	230
11	Glenn	55	41	San Mateo	938
12	Humboldt	297	42	Santa Barbara	580
13	Imperial	149	43	Santa Clara	1,684
14	Inyo	40	44	Santa Cruz	389
15	Kern	702	45	Shasta	316
16	Kings	190	46	Sierra	3
17	Lake	99	47	Siskiyou	99
18	Lassen	34	48	Solano	486
19	Los Angeles	16,366	49	Sonoma	607
20	Madera	80	50	Stanislaus	885
21	Marin	329	51	Sutter	231
22	Mariposa	26	52	Tehama	71
23	Mendocino	180	53	Trinity	24
24	Merced	276	54	Tulare	561
25	Modoc	20	55	Tuolumne	142
26	Mono	6	56	Ventura	922
27	Monterey	475	57	Yolo	209
28	Napa	338	58	Yuba	208
29	Nevada	164	59	Out of State	4,536
30	Orange	3,335	60	Out of Country	239
				Prefix Count	54,009

Source: Board of Vocational Nursing and Psychiatric Technician Examiners.

in America are the least mobile), 2) age and family (a higher proportion of L.V.N.'s are older women whose incomes are supplemental rather than primary and who are tied to a husband's work location) and 3) low salaries, which do not provide sufficient inducement to move any great distance. "So in a sense, the L.V.N. is a more static and reliable supply for the area where she is trained than is the R.N.", the state study concludes.(1)

Distribution of L.V.N.'s

"With L.V.N.'s, the problem of distribution seems to be accentuated by their relative immobility," the State Department of Finance writes.(1) "Since L.V.N.'s are less mobile, the distribution of their educational programs is important. The shortages of L.V.N.'s tend to be where there are no local programs."(11) No vacancy figures for L.V.N. positions in variou communities have been compiled due to time limitations. Table V- 27 shows the distribution of licensed L.V.N.'s by county.

Educational Opportunity

Educational opportunity is defined as the ability of an adequately prepared and motivated person to achieve his educational goal within the health sciences.(16) Two main issues are involved, the experience of Californians in achieving placement in health science programs in the State, and the relations of this placement to the ethnic grouping of the individual.

Chance of Placement

Data on the rejection rate of nursing applicants is not entirely clear according to Robert Tumelty.(16) Indications from nursing programs of all levels throughout the State show that although the number of graduates from every program (except the phasing-out Diploma programs, of course) is increasing, the applicant rate is many times the number of places available. Many nurse aspirants experience great difficulty in gaining entrance to nursing programs in the State.(1) With the start-up of a Master's degree clinicians program, Tumelty writes, the rejection rate will no doubt increase.(16)

Tumelty notes that at the University of California at San Francisco (UCSF) more than 400 applicants a year are rejected from the Baccalaureate level degree program, which Ver Steeg states is among the top ten nursing schools in the United States.(11) Californians are favored applicants there, however. Statistics show that approximately 90% of the entering classes at UCSF and UCLA consited of California residents. (See Table V-28, next page).

The fastest expansion of nursing programs and admissions, as noted in Section 2 of this chapter, is taking place at the Community College level, whose planning and programming authority comes primarily from local, not statewide sources. Yet this expansion cannot begin to place the number of students who apply each year, even discounting multiple applications from individual

TABLE V-28

FIRST YEAR STUDENTS IN CALIFORNIA PROGRAMS OF NURSING EDUCATION, BY RESIDENCE PRIOR TO ADMISSION - 1975

Pre-Service Program	Percentage of Students			
	California	Other U.S. States	Foreign	Total
Public	% #	% #	% #	% #
U.C. System:				
U.C.S.F.	86.6 (277)	10.6 (34)	2.8 (9)	100 (320)
U.C.L.A.	89.8 (114)	7.9 (10)	2.4 (3)	100 (127)
Total	87.5 (391)	9.8 (44)	2.7 (12)	100 (447)
CSUC System:				
Fresno	94.1 (64)	0	5.9 (4)	100 (68)
Humboldt	91.9 (20)	9.1 (2)	0	100 (22)
Long Beach	91.7 (33)	2.8 (1)	5.5 (2)	100 (36)
Los Angeles	100.0 (27)	0	0	100 (27)
Sacramento	97.7 (42)	0	2.3 (1)	100 (43)
San Diego	96.4 (27)	3.6 (1)	0	100 (28)
San Francisco	84.3 (59)	1.4 (1)	14.3 (10)	100 (70)
San Jose	100.0 (68)	0	0	100 (68)
Total	93.9 (340)	1.4 (5)	4.7 (17)	100 (362)
Private				
Azusa Pacific	83.8 (31)	16.2 (6)	0	100 (37)
Biola	73.7 (42)	24.6 (14)	1.7 (1)	100 (57)
Mt. St. Mary's	91.9 (102)	5.4 (6)	2.7 (3)	100 (111)
Pt. Loma	90.0 (30)	9.1 (3)	0	100 (33)
Loma Linda	85.2 (127)	11.4 (17)	3.4 (5)	100 (149)
*U. of San Francisco	84.7 (127)	15.3 (23)	0	100 (150)
Total	85.5 (459)	12.8 (69)	1.7 (9)	100 (537)

* Estimate

Compiled from information sent to the Health Manpower Study Office by the individual schools, Spring 1976.

students. Due to the reimbursement structure of the community college, based on placement of local students, and to the strict territorial boundaries of these colleges, it would seem that the community college nursing programs generally attempt to place students from the local area in their programs. However, easy residency requirements allow many to be categorized as "local" even though they may have just moved to the area. Complete data is not presently available regarding this. It has been noted elsewhere that the main cause for expansion of the nursing programs at the community college level is due to student demand. (See Section III, Pg.370)."Many people on the Nursing Board and in education see the supply growing too fast, not for health needs nor student placement, but for employment realities."(1)

The nursing graduate schools of the University of California also tend to attract many students whose basic nursing education was acquired out of the State. These graduates in turn, once having obtained the M.S. and Ph.D. in nursing, tend to be very mobile both within and out of the State.(11)

Table V-28 shows the breakdown of place-of-origin (residence) of students admitted to California nursing programs in 1975. As can be seen a very small percentage of the students in any of the public programs came from outside of California, with the highest being 13.4% at UCSF; while several of the State Colleges reported no new out-of-state students. The private nursing schools had a generally higher percentage of out-of-state students, with the highest being about 25% at Biola College.

TABLE V-29

RESIDENCES OF NEW NURSING MAJORS - CSUC, 1975

	BAK	CHI*	FRE*	FUL	HAY	HUM	L B	L A*	SAC	S B	S D	S F	S J*	SON	TOTAL
New Post-Baccalaureate Students															
California	2	11	27	-	3	-	-	44	7	-	-	-	10	6	110
Other States	-	-	1	-	-	-	-	1	-	-	-	-	-	-	2
Foreign	-	-	-	-	-	1	-	1	-	-	-	-	-	-	2
Undergraduate Transfers															
California	16	13	83	76	16	10	109	162	55	10	35	40	46	75	746
Other States	-	2	-	-	-	-	-	1	1	1	1	1	-	1	8
Foreign	-	-	-	-	-	-	6	2	-	-	-	-	-	-	8

* These schools offer Master's degrees as well as Baccalaureate degrees in nursing.

Source: Division of Institutional Research, Office of the Chancellor, the California State University & Colleges, Los Angeles, California.

Key:
BAK - Bakersfield
CHI - Chico
FRE - Fresno
FUL - Fullerton
HAY - Hayward
HUM - Humboldt
L B - Long Beach
L A - Los Angeles
SAC - Sacramento
S B - San Bernardino
S D - San Diego
S F - San Francisco
S J - San Jose
SON - Sonoma

Table V-29 shows the breakdown of origins of nursing students in the California State University and Colleges system for undergraduate transfers and new post-Baccalaureate students (those already having a Baccalaureate in a field other than nursing and enrolled in the B.S. nursing program of the school, or those with a Baccalaureate in nursing and enrolled in an M.S. nursing program of the school). Again the percentage of students from outside of California in these programs in 1975 was less than 10%.

Again, data showing number and place-of-origin of nursing school applicants, which could be compared to number and place-of-origin of nursing school students is not available. Generally it can be concluded that while it is difficult for any applicant to get into a California nursing school, due to the number of applications, it may be easier for a California resident than for an out-of-state applicant.

TABLE V-30

FIRST YEAR STUDENTS IN CALIFORNIA PROGRAMS OF NURSING EDUCATION BY ETHNIC GROUP - 1975

Pre-Service Program	Percentage of Students Black	Oriental	Native American	Mexican American	Other Non-White	All Minorities	Caucasian	TOTAL
Public								
U.C. System:								
U.C.S.F.	4.4%(14)	8.8%(28)	0	1.8%(6)	0	15.0%(48)	85.0%(271)	100%(319)
U.C.L.A.	5.9 (3)	19.6 (10)	0	11.8 (6)	2.0 (1)	39.2 (20)	60.8 (31)	100 (51)
Total	4.6 (17)	10.3 (38)	0	3.2 (12)	1 (1)	18.4 (68)	81.6 (302)	100 (370)
CSUC System:								
Fresno	7.7 (5)	4.6 (3)	0	7.7 (5)	3.1 (2)	23.1 (15)	76.9 (50)	100 (65)
Humboldt	0	0	0	4.8 (1)	0	4.8 (1)	95.2 (20)	100 (21)
Los Angeles	52.6 (10)	10.5 (2)	0	10.5 (2)	0	73.7 (14)	26.3 (5)	100 (19)
Long Beach	20.6 (7)	5.9 (2)	5.9 (2)	11.0 (4)	11.8 (4)	55.9 (19)	44.1 (15)	100 (34)
Sacramento	5.1 (2)	0	2.6 (1)	0	2.6 (1)	10.3 (4)	89.7 (35)	100 (39)
San Diego	14.8 (8)	3.7 (1)	0	0	3.7 (1)	22.6 (6)	77.8 (21)	100 (27)
San Francisco	16.7 (9)	13.1 (7)	3.7 (2)	1.9 (1)	25.9 (14)	61.1 (33)	38.9 (21)	100 (54)
San Jose	14.3 (1)	0	0	14.3 (1)	0	28.6 (2)	71.4 (5)	100 (7)
Total	14.3 (38)	5.6 (15)	1.9 (5)	5.3 (14)	8.3 (22)	35.3 (94)	64.7 (172)	100 (266)
Private								
Azusa Pacific	2.7 (1)	0	0	5.4 (2)	0	8.1 (3)	91.9 (34)	100 (37)
Biola	1.8 (1)	7.0 (4)	0	3.5 (2)	0	12.3 (7)	87.7 (50)	100 (57)
Mount St. Mary's	2.6 (4)	5.9 (9)	1.3 (2)	6.5 (10)	0	16.3 (25)	83.7 (128)	100 (153)
Pt. Loma	3.0 (1)	6.1 (2)	0	0	6.1 (2)	15.2 (5)	84.8 (28)	100 (33)
Loma Linda	4.0 (6)	4.7 (7)	1.3 (2)	5.4 (8)	10.1 (15)	25.5 (38)	74.5 (111)	100 (149)
U. of San Francisco	5.3 (8)	5.3 (8)	0	6.7 (10)	3.3 (5)	20.7 (31)	79.3 (119)	100 (150)
Total	3.6 (21)	5.2 (30)	1 (4)	5.5 (32)	3.8 (22)	18.8 (109)	81.2 (470)	100 (579)
TOTAL	6.3 (76)	6.8 (83)	1 (9)	4.8 (58)	3.7 (45)	22.3 (271)	77.7 (944)	100 (1215)

Compiled from data sent to the Health Manpower Study Office by the individual schools, Spring 1976.

Ethnicity of Nursing Students

Table V-30 shows the ethnicity of first year (entering class) students in a sample of California nursing programs. At the two University of California nursing programs, marked differences can be seen. Overall, UCLA's entering nursing class of 1975 had more than twice as many minority students as did UCSF; the percentage of minority students in that class is almost three times as much as the percentage of UCSF. As can be seen, UCLA had more minorities in all categories. Although, it appears from the data that neither university has any Native Americans in its entering class.

The number of minorities in other California colleges and schools of nursing varied widely, both individually and as systems. Various number games can be played with these statistics in comparing which ethnic groups are more represented in which school and which system. The meaning of these games, however, would be hard to analyse at this point since these statistics have not been kept over a long enough period of time to show any particular pattern; thus no attempt to analyse them will be made here. In addition, it may be a misuse of sampling to compare percentages of persons in or applying to a program with the percentage of that same group in the total population; although the position is emotionally charged, it can be argued that the number of minorities admitted to nursing school programs should be compared, by group, with the total number of qualified applicants.

TABLE V-31
COMPARISON OF ENTERING CLASSES IN CALIFORNIA NURSING EDUCATION PROGRAMS WITH CALIFORNIA'S ETHNIC COMPOSITION - 1975

Ethnic Group	State Composition[1]	Percent of Students Public U.C.	CSUC	Private*
Caucasian	78.0	81.6	64.7	81.2
Black	7.0	4.6	14.3	3.6
Native American	0.5	0	1.9	1
Oriental[2]	2.6	10.3	5.6	5.2
Mexican American	11.0	3.2	5.3	5.5
All Others	0.9	1	8.3	3.8
Total Minority	22.0	18.4	35.3	18.8
Total Caucasian	78.0	81.5	64.7	81.2
Grand Total	100.0	100.0	100.0	100.0

[1] U.S. Bureau of the Census, 1970 Census of the Population

[2] Includes Chinese, Japanese and Filipinos

* Azusa Pacific College, Biola College, Loma Linda University, Mt. Saint Mary's College, point Loma College, and the University of San Francisco.

Compiled from data sent to the Health Manpower Study Office by the individual schools, Spring 1976.

Probably more significant than the tables showing the ethnic background and sex designation alone, is Table V-31, which compares the ethnic composition of the entering class of students in California nursing programs in various school systems with the State's overall ethnic composition. Here it is shown that the Universtiy of California program and the private programs are only slightly overrepresented with Caucasians, while the State University and Colleges system is largely underrepresented.

By ethnic group, Orientals can be seen to be overrepresented in all systems by as much as four times. Blacks in the State University and Colleges system are overrepresented by more than twice their percentage of the State's population, while being underrepresented by nearly half in the private schools, and slightly more than half in the University of California. Native Americans are underrepresented only at the University of California and overrepresented in the other systems. Mexican Americans are underrepresented in all systems by at least half.

On the average, then, it can be found that the minorities are slightly overrepresented in California nursing programs with a placement of 24.16% in the 1975 entering class as compared to a 22% representation in the State as a whole. The majority Caucasians are thus slightly underrepresented with 75.84% in the entering class as compared to 78% in the overall State population.

3. DEMAND TRENDS

Market Demand and Projections

Demand for nursing services has traditionally been determined by two methods: 1) actual vacancies in nursing employment facilities (market factors) and, 2) estimations by concerned professional and consumers as to what the real demand is for nursing services according to their own perceptions (need factors). Objectively it would seem that fairly accurate short-term projections of demand could be based upon per population ratios, or upon hospital construction and known average bed occupancy rates correlated with standardized mixes of personnel services including nursing. However, no nurse-per-population ratio has ever been agreed upon as being adequate, (in 1970 the U.S. Surgeon General Consultant Group on Nursing recommended a minimum of 319 practicing registered nurses per 100,000 population, which, can be seen in Table V-2 , the entire nation is well over by 1975); various economic and other influences which modify the decision to budget and/or to hire nurses in any given situation make the existence of budgeted nursing vacancies in hospitals similarly lacking as an analytical tool.(11) There simply is no really good objective way to determine demand for nursing services. (11) (*See page 375).

Much has been and is being written about the changing role of nurses and the health delivery system. "There has been a noticeable shift to an emphasis on the prevention of illness and promotion of high level wellness, and it is becoming increasingly evident that health care must be offered in a wider variety of places," writes one nursing educator.(2) 1972 data show that only one quarter of the care given to patients occurred in hospital settings and that recipients of care received three quarters of their care outside of the hospital. The decrease in the number of days spent in the hospital reflects another trend as well: the increasing sophistication and specialization of medical care. New techniques such as organ transplants, kidney dialysis and chemotherapy, for example, require highly specialized nurses with the technical skills and ability to make informed judgements about the patient's care (1) during the shorter time he is in the acute care facility.

At the same time that hospital usage is going down, group practice is increasing. "The day of the solo practitioner is rapidly drawing to a close," Pope said at the December California Health Manpower Conference which preceded this report. Modern technology and malpractice premiums make participation in some sort of organized system essential for all health professionals. Although professionals have traditionally not been taught how to cope with bureaucracies and still deliver good care, group management and administrative skills are now beginning to be taught to nurses.

As with nursing skills, the management of nursing had changed to reflect changes in organizational administration throughout the country; health personnel management has gone the full circle from "Scientific management" of the 1920s (the assembly-line process of breaking large tasks into less complex ones which could then be done routinely by lesser-trained, lesser-paid workers), to an era of "Job Enrichment" (11) and satisfying where workers and employers seek jobs and personnel that will satisfy as many requirements as possible such as responsibility, salary, time worked, etc. Because of this, we see now the beginning of many variations of work roles, mixes of personnel, mixes of working hours, and cooperative arrangements between different kinds of manpower and facilities to fit the local conditions of supply and utilization of technological innovations.

Because this is a period of transition and change, it is no wonder that there appears contradictions in analysis and interpretations of data reflecting supply and demand of nursing personnel.

As shown in Table V-4 , it has been estimated that in 1975 there were 92,161 active RNs employed in California; it was projected that 109,949 would be active by 1980, an average of 3,558 more registered nurses a year. The California Employment Department estimates that between 1975 and 1980, market demand and attrition (replacement) factors will account for 46,073 position openings in nursing between 1975 and 1980, an average of 9,215 a year . (See Appendix E, page E-1) If these figures are correct, it seems there would be a demand for 5,657 more registered nurses per year than will be met by the projected supply (DeiRossi shows that this supply could be met by increasing the number of graduate nurses by 7%).

Yet unemployment of nurses in California is becoming, according to several sources, "a new crisis." (1) A survey of nursing directors undertaken by the Board of Nursing Education and Nurse Registration in 1973 revealed that many nurses were unable to find employment in metropolitan areas of California such as Sacramento, San Jose, San Francisco, Oakland and San Diego. (3) These trends, when combined with declining hospital occupancy and hospital construction, strongly indicate that employment problems are likely to get worse and not better in the near future. (11) Recent expansion of nursing programs appears to be based primarily on demand of students who are clearly not informed of the facts regarding nursing employment.

One possible reason for the discrepancy between job projections for nurses, and unemployment of nurses may be the kinds of jobs that are available. "The majority of the areas that have vacancies, have them only in shift work, in specialties like operating room or gynecological nurse, or in less desirable employment areas like convalescent homes" according to one state source. (1)

Demand for LVNs

Rising hospital costs have contributed both to the positive and also to

TABLE V-32
NUMBER OF VACANCIES IN NURSING POSITION IN CALIFORNIA 1974-75, BY SELECTED REGIONAL AREAS

AREA	COUNTIES/ CITIES COVERED	*POPULATION COVERED	RN's	LVN's	Nurs. Assts.	Public Health Nurse	Clinical Nurse
I Northwestern California (889,500)	Sonoma	259,500	24	23	25	0	2
	Marin	302,100	8	6	20	0	0
	Napa	100,900	16	3	12	0	0
	Lake & Mendocino	74,900	9	3	7	0	0
	Humboldt & Del Norte	152,100	11	7	3	0	0
	Total:		68	42	67	0	2
II Golden Empire (1,821,300)	El Dorado	69,900	0	0	1	0	0
	Nevada	26,600	0	1	1	0	0
	Placer	110,600	3	3	1	0	0
	Sacramento	915,300	135	78	47	0	0
	San Joaquin	343,400	88	41	39	1	0
	Sierra	2,100	2	1	0	0	0
	Stanislaus	216,100	36	15	19	1	0
	Yolo	137,100	11	2	2	0	0
	Total:		275	140	110	2	0
III Central San Joaquin (1,017,900)	Fresno	544,300	75	49	49	1	1
	Kings	86,800	1	0	0	0	0
	Madera	48,400	2	2	0	0	0
	Mariposa/ Merced	121,400	7	0	1	0	0
	Tulare	216,800	24	10	4	0	0
	Total:		109	61	54	1	1

TABLE V-32 - continued

Vacancies in Nursing--(1974-1975) (continued)

AREA	COUNTIES/ COVERED	POPULATION COVERED	RN's	LVN's	Nurs. Assts.	Public Health Nurse	Clinical Nurse
IV Kern (409,400)	Kern	409,400	23	19	32	1	2
	Total:		23	19	32	1	2
V Channel Counties (1,125,000)	Santa Barbara	410,300	21	7	26	0	0
	San Luis Obispo	152,400	16	2	13	0	0
	Ventura	562,300	43	4	3	0	0
	Total:		80	13	42	0	0
VI Coastal Region (933,107)	16 incorp. cities several unincorp. areas incorp tracts of City of LA		131	46	52	6	0
	Total:		131	46	52	6	0
VII San Fernando Valley (1,272,698)	* San Fernando Santa Clarita Antelope	1,142,198 54,400 76,100	85	30	33	0	4
	Total:		85	30	33	0	4

* Convalescent facilities also included)

TABLE V-32 - continued
Vacancies in Nursing--(1974-1975) (cont'd)

AREA	COUNTIES/ CITIES COVERED	*POPULATION COVERED	RN's	LVN's	Nurs. Asst.	Nurse	Nurse
VIII Orange (1,815,700)	Orange	1,815,700	143	30	74	0	3
	Total:		143	30	74	0	3
TOTAL		8,284,605	914	381	464	13	15

*Source: Reference Book on Selected Health Manpower Data in Calif. (Projected 1975 Population)

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a negative demand for Licensed Vocational Nurses. On the one hand, it has been noted that in an effort to cut health care costs, hospitals have begun to hire more LVNs than RNs because of the lower rates of pay,(1) although no exact figures are available to ascertain this. However, it is fact that the proportion of registered nurses has declined and the proportion of LVNs has increased.(11)

On the other hand, it seems certain that there will be a continually greater emphasis upon technical expertise at whatever level...which lends itself to the substitution of less well-trained personnel, or at least of less broadly-trained personnel, for more well-trained personnel.(1) Affecting the demand for the LVN is the greater use being made of such items as disposable sheets, syringes and other equipment, which used to require more of the LVNs time to care for than the hospital has found economically worthwhile. As labor costs increase, this tendency toward the use of pre-packaged drugs and disposables of all types may well be able to decrease the amount of overall nurse manpower required.(1)

Impact of National Health Insurance

Specific predictions and projections on the impact of the "inevitable" development of National Health Insurance upon nursing manpower have not been made. There are many speculations, however, one nursing educator writes: "predicitions are that a National Health Insurance program will respond to consumer requests and will increase the emphasis on the promotion of health. Immediately there will be a need to prepare new and different personnel and to augment existing health care providers.

We can expect increasing input from the consumer as he becomes a more involved participant and a more direct source of payment for services. It will most certainly be necessary to utilize personnel more effectively and to make health care more cost effective." (2)

A presentation at the White House in 1975 on health manpower issues has this to say about the impact of national health insurance:

> "The impact of the introduction of comprehensive national health insurance would, in all likihood, be more dramatic for those specialties having principal responsibility for ambulatory care services than for those which are hospital-based. (3)

In this light, the demand for primary care nurse specialists and physician substitutables could very well increase as federal support emphasizes ambulatory care, health maintenance and preventative services.

(*For a detailed description of four major ways to determine health manpower requirements --1) the number approach, 2) the utilization approach, 3) the consumer approach, and 4) the total health approach --see 1970 California Health Manpower, Four Major Approaches to Determining Health Manpower Requirements and Ways to Meet Them; Health Manpower Council of California, Revised July 1971; Orinda, California by Ann Lewis and Kenneth L. Briney.)

4. UTILIZATION TRENDS

Actual utilization of nurses then would seem to be the more accurate way to describe demand for nursing personnel than market factors. Yet it is here where needs of the people must be described in terms of their own perceptions of the kinds of services they seek. Criteria considered by health professionals to be essential for optimal level of nursing care for individuals and families, while probably the most professional information to go by, must also be suspect for vested interests. As several researchers have noted, "Estimates of demand for nurses, as measured by number of positions employers offered, are usually lower than the numbers judged by the professions as needed to provide nursing care for the people.(12)

Nurse Specialists

Historically, andstill today as the chart shows on Table V-22, nurses are found mainly in hospitals and large health care facilities; originally nurses were seen as the logical group to which subordinate tasks could be taught.(12) The advent of nurse specialists in highly technologized units such as the Cardiac Care Units and Intensive Care Units, however, where charge nurses had to act in emergencies without physicians present, and the advent of the Nurse Practitioner programs only recently have made medical personnel come to gripe with the fact that nurses had long been practicing in violation of the Medical Practice Act.(12) According to Ver Steeg, "The necessary changes in the law and their subsequent interpretation have only been part of the story. Prior to, during, and subsequent to the passage of the new laws, there have been considerable efforts between medicine and nursing to develop a working relationship on a new basis. Now the new law does provide for collaborative practice between physicians and nurses, all but in multidisciplinary health care systems only. The new definition steers clear of hierarchic controls which are otherwise so prevalent in the laws dealing with health delivery and financing. (5)

Many researchers point out that while vast changes have been made in the past decade, the actual delivery of health services, with subsequent dramatic effect on the morbidity and mortality rate of the population, that the delivery system itself has remained essentially the same since the turn of the century. These advances, along with their obvious benefits, have also spawned specialization, underutilization, overtraining, duplication, and great fragmentation, all which have been cited as factors in rising health care costs, aside from the forces of inflation. (5)

As with physicians, the issue of nurse specialty raises problems not yet refined by health planners; that is the problem of specialty distribution. "Ideally manpower resources should be a derivative function of health services needed to achieve specified health goals and those in turn translated into manpower requirements. But the estimation of manpower requirement cannot be isolated from local "environmental" considerations such as geography, demography, socio-economic factors, health care expectations, etc. Studies of physician distribution by specialty point clearly to a current and continuing shortage in the primary care specialties, particularly those related to general medical care. "Even the increased training and utilization of new health practitioners such as physician's assistants and nurse practitioners is not likely to reduce the demand for primary care physicians by more than 5% under optimal conditions by 1980. (5)

Nurse Practitioners

The concept of non-physician primary care providers has evolved in the past fifteen years from an idea to a nationally viable profession. (13) The new definition of RN practice under the Nurse Practice Act legislation is deliberately non-specific as to the listing of health care tasks or procedures, although of course remote controls (written policies and protocols and/or communication by electronic means) and physician review are assumed in all of the expanded functions. Some of the shortage areas in which RNs under their expanded roles could have a major impact include:

Primary Health Care;

Prenatal Care and Family Planning;

Critical Care in Acute Care Settings;

Counseling, Health Education, Emotional Support of Intervention in Community and Private Settings;

Regular Screening, Examinations and Health Assessments (15)

The table below shows the number and kinds of nurse practitioners that were being trained in California in 1972 alone:

Table V-33 . Types of Nurse Practitioners

Family Nurse Practitioner	120
Pediatric Nurse Practitioner (Includes School Nurse)	249
Adult Nurse Practitioner	140
Obstetric-Gynecologic Nurse Practitioner	72
Family Planning Specialist	89
Psychiatric/Mental Health	20
Total	690

By 1975 some programs in the following specialties had been improved under AB 1503, Chapter 1350:

Family Practice;

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A common professional benefit cited is the additional time it gives physicians to focus on acute problems for which he is trained, leaving the routine problems to the practitioner. Problems cited, mainly from the physician point of view, are those of malpractice insurance, reimbursement, at present there is no direct reimbursement by third party payers, the delegation of patient care responsibilities (14) and the kind of legal corporate structure from which a nurse practitioner may act. It seems doubtful that under the Moscone-Knox Professional Corporation Act of 1968 that a professional corporation of physicians would be allowed to use nurse practitioners, since they would then be defying the single profession criteria of the act. The Medical Practice Act also prohibits the use of corporate administrative structure for collaborative but independent practice between physicians and nurses, but their are prohibitions against fee splitting in this arrangement. When the only collaborative mechanism left between physician and nurse practitioner is then that of employer and employee, the whole matter of malpractice insurance and third party reimbursement comes up. (15) Present regulations also seriously inhibit the utilization of nurse practitioners in the care of hospitalized patients.

From the educator's point of view, the two major problems are: 1) the establishment of uniform, acceptable standards for practitioner programs, and 2) assurance of academic credit for the students. Involved in this are the questions of which educational institutions should train practitioners, what are the appropriate clinical sites for the practitioners, what should the admission criteria be, and how far can they be used as substitutes for hospital house staff and/or the foreign medical graduate? Medical faculty at the University of California in San Francisco, have delved into these questions in detail. (14)

Pediatrics;

Maternal Care;

Midwifery;

School Nursing;

Geriatrics;

Family Planning.

These projects, varying in length and numbers from three months to two years expected to train approximately 1,732 nurses.

Statistics show that since the training programs began, 12.3% of the trainees left the state, 60% stayed in California and are utilized in the expanded role for which they trained and the remainer are either not employed/ utilized in an expanded role and/or their status is unknown.(13)

The table below shows the projected number of physician assistants and nurse practitioners to 1980 to be trained in the United States. The nurse practitioners and Medex-P.A. are virtually 100% engaged in primary care practice training, while approximately only one-half of the physician assistants are in primary care specialties.

Table V-33a. PROJECTED NUMBER OF PHYSICIAN ASSISTANTS AND NURSE PRACTITIONERS TO 1980

	Physician Assistants	Medex-PA's	Nurse Practitioners	Total
1974	2,000	500	3,800	6,300
1976(est.)*	4,400	900	5,800	11,100
1980(est.)*	8,400	1,700	9,800	19,900

* Based on stable, federal program support.

Numerous studies have demonstrated popularity of nurse practitioners and physician assistants, linked usually to accessability and acceptability factors.

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Other Nurse Specialists

As mentioned above, specialists deriving from a specialized health service are easier to plan for. Such nurse specialists as the CCU nurse, ICU nurse, ER nurse have specialized functions within their service unit and depend on the existence or not of that unit. Most of these nurses are trained in special continuing education training programs, usually without academic credit for an advanced degree.

Nurse specialists in ambulatory care settings include the nurse practitioner and the public health nurse, who may function as much as a health educator in a public health or school setting as she does a deliverer of health care services. The demand for this kind of nurse specialist is not clear, however, one can speculate that the demand may increase. Congressional interest in preventative medicine including a delivery system which emphasizes prevention (the Prepaid Health Plan and Health Maintenance Organization concept), coupled with increasing utilization of ambulatory health care settings by the public (such as emergency rooms), may well indicate a growing need for nurse specialists, who may also function as health educators.

New Trends

Donna Ver Steeg writes that, "The history of the development of the various health professions and of the health care industry undergirding them is the story of the varying responses over time by society to two key issues: 1) who decides that health care is needed; and 2) who pays for the care provided.

It is widely recognized that the current system of delivery is inefficient and in many ways ineffective, despite the technological innovations and advances which have marked the delivery of health care services in the past decade. Ver Steeg and others all write that the system must and will soon have to change to respond to not only the new technologies of health care, (such as new life support systems and perinatal techniques) but to new perceptions of health care as well, (such as health supervision and support services available in the home, and more positive means to approach death).

The traditional authority to name health problems (i.e. to diagnose), which has long been considered by the physician to be sacred and reserved to that profession alone, is being opposed by system analysts and other who have dissected down the visible clinical skills and delegated them to less expensive personnel, Ver Steeg writes, "The tradition that physicians, as the most highly-educated groups, are the most highly paid is also being challenged by those who delegate physicians routine tasks to lower paid personnel without taking into account the time of the more highly-trained professional responsible for workind with and overseeing the quality of the services provided. Similarly, the function of the fee for service as a regulator of demand is being studied closely as new fee systems for health care services are being considered. In all of these changes, nurse inevitability have an intricate role.

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5. CLINICAL TRAINING

Historically, when most nurses were trained in hospital-based Diploma programs, clinical training was carried on concurrently in the hospital-school setting. With the advent of the academically-based nurse training programs and the demise of the hospital-based Diploma schools, clinical training sites, times and supervision has become a matter of negotiation between nursing faculty and clinical facility.

The negotiation for clinical training of health personnel has become a great, and largely unstudied problem in California where there are numerous training programs and limited number of clinical facilities. At a conference on the "Cooperative Use of Clinical Facilities for Nursing Students," sponsored by the Chancellor's Office of the California Community Colleges, in Sacramento on October 16, 1974; a number of these problems were highlighted. The following is a compiled list of some of the problems cited by the panel[*] and the audience of nursing educators, directors of nursing, and hospital administrators:

1) Scheduling Problems:

   a) There is competition for the prime time (mid-morning and mid-afternoon) when health care activity is at its peak of a certain, few large acute care facilities. There simply is not enough time, supervisory personnel nor a large enough patient ratio to fit all students in. Often, other secondary time shifts in acute care hospitals are not utilized at all; the hospital can be empty of students during some periods of the day and crowded with students during other periods. Meanwhile, other facilities such as convalescent facilities, who would like nursing student and faculty participation, are not utilized as training sites.

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[*] The panel included: Ray Bollinger, Executive Director, Marin County General Hospital; Ellen Polfus R.N., Director of Nursing, Woodland Memorial Hospital; Camelle Griffin R.N., Director of Nursing Education, City College of San Francisco; Michael Buggy R.N., Executive Secretary, Board of Nursing Education and Nurse Registration; and Lloyd Livingston, Dean of Occupational Education, Shasta College.

b) Clinical exposure does not immediately follow academic/didactic instruction at times.

2) Supervision Problems:

a. The cost of hospital personnel time taken with educational, rather than patient care activities is a hidden expense and problem for host hospitals to justify.

b) There is rarely one single hospital spokesman in charge of and responsible for the student training programs to whom nursing education students could go when there are problems.

c) There is a lack of regularly planned and scheduled supervisory site visits by nursing faculty.

d) Accountability of students, faculty and host hospital personnel during the educational activities is not clear.

3) Management Problems:

a) Too much administrative time is taken with meetings regarding educational activities.

b) There is a lack of provider input into the planning of educational activities in the clinical facility.

c) New and/or expanded health manpower training programs fail to plan or consider clinical training aspects; clinical training seems to have a low priority in the planning of future programs.

d) Assessments and evaulations of the clinical training programs often is not done regularly nor includes administrative personnel.

4. Curriculum Problems:

a. The level of the students' learning processes is not specified in terms of what kind of exposures really teach students to do, and not just teach them to observe someone else doing.

b. Exposure to clinical aspects of nursing relative to didactic elements may be too late in terms of career education (in other words, some students find that when they actually get into the clinical setting, they do not want to make a career of nursing after all.)

c) Clinical training curriculum, in some cases, seems oriented more towards training the student to pass the licensure examination, than making the student actually ready to practice nursing.

5. Attitudinal Problems:

a) Conflict between taking time to meet a student's educational needs or a patient's health care needs is disturbing to some hospital personnel.

b) Nursing/patient role is not emphasized due to scheduling during prime time which highlights the medical practitioner/patient role instead.

c) Popularity of nursing and the image of its secure employment seems to attract many undedicated students who don't like the realistic hospital setting and real nursing conditions.

This informal listing of problems brought out at the previously mentioned conference two years ago, points out some of the conflicts between the nursing educators and the hospital personnel on whom they depend regarding clinical placement of students. It is interesting to note what one hospital administrator, Mr. Ray Bollinger, Executive Director of the Marin County General Hospital pointed out as the five positive aspects of nurse education programs in hospitals:

1) Increasing awareness of hospital staff regarding currency of skills and new nursing practice knowledge,
2) Increasing supply of trained personnel, both for one's own facility in the future and others in the area, thereby reducing the costs of "orientation" of new nursing employees,
3) Ability to provide a higher level of care (in terms of number of service personnel) to patients for no or small costs,
4) Increasing lines of communication between employers and trainers of health manpower (although he admits that this must also be tightened up.)
5) Setting up and getting input from an active and relevant advisory board in the form of the nursing education committee of the hospital.

Little was said at this conference and there is little data on the standardization of criteria for the selection of training facilities. There was much discussion regarding the use, in some programs of contracts between the educational and clinical facility which specified details of the training programs such as the role of facility and educational supervisors, their respective responsibilities towards the students, the goals and objectives of the program, the number of students,

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the control mechanisms, the counseling processes, the student admission processes and the curriculum content. There was consensus that particularly nursing educators would benefit from learning more about the mechanisms of executing contracts of this kind.

The need for data and some regional studies which could aid in the coordination of clinical placement between facilities and educational programs was discussed at length. A Clinical Placement Guide, developed by the Health Services Education Council of San Jose was presented as a project which addressed the need to coordinate clinical placement within a certain geographic boundary. The Guide(16) uses a standardized request format which is sent to each facility and nursing program in late winter. All requests for facility placement are to be made within a certain time, and a two-week period is designated for the facilities to notify the schools of the final acceptable schedule. Within this period, resolution of conflicting requests can be made. The Placement Guide is then published and distributed with the final schedules showing: unit and/or experience desired, dates of placement, days and weeks, hours, number and level of students participating, instructor's name; and any special arrangements that have been made.

The Board of Nursing is cognizant of the problem of clinical placement of nursing students and cite the lack of adequate clinical facilities to accommodate expanding nursing education programs as one of the reasons there should be a moratorium imposed on such programs for the near future.(1)

In addressing the problem further, Charles Pillsbury writes: "Presently, clinical nursing training takes place in a daytime hospital setting. Innovation in the use of other nurse settings such as community health centers could produce nurses who will be ready to assist in delivering the 88% of all health care services that are needed in the community, and not in the hospitals that all nurses are presently trained to work in."(1)

Donna Ver Steeg writes that "the State College and University system has done an initial survey of clinical facilities for the preparation of health professionals, including nurses. The Community College system plans a similar survey. These should be available shortly and will, hopefully, provide the basis for rational decision-making on the appropriate use of these facilities".(11)

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6. RECOMMENDATIONS

The following recommendations regarding nursing education in California are presented here for consideration by the California Legislature. These recommendations are made as a result of compiling the various resources used as information in this report. All address problems discussed in this report and listed in the Introduction.

It is respectfully recommended that the California Postsecondary Education Commission sponsor the following activities in order to address problems detailed in this report:

1. Sponsor Comprehensive Studies of:
    a. Projected demand for generalized and specialized nursing care services including the following factors:
        1. impact of development of prepaid health plans;
        2. cost of such nursing services;
        3. price for alternative services;
        4. financial resources of training & employer facilities;
        5. size of population & population growth factors, including income per capita;
        6. statistics regarding facility usage where nurses are employed;
        7. relationship between health care expenditures and GNP;
        8. national trends & actions of the federal government and legislation which may have significant impact on nursing manpower demand in California.
    b. Costs and benefits of alternative approaches to providing continuing education and monitoring continuing education for health professionals.

2. Support Sytematic and Comprehensive Data Collection of:
    - a. Nursing employment, job turnover, and other job availability factors;
    - b. Percentage of employed minority nurses, minority nurse labor participation statistics and minority attrition rates;
    - c. Legality of various collaborative agreements and corporate structures between physicians and extended role nurses.
3. Develop Policy Statements and Actions on:
    - a. Articulation between various levels of nursing programs considering credit transfer and achievement testing;
    - b. Formalized career ladders between various levels of nursing training;
    - c. Allocation of nursing program faculty time in terms of percentage of time for instruction, research and community professional services;
    - d. Definition of roles of variously trained registered nurses;
    - e. Decentralizing nursing education via extended degree programs;
    - f. Academic status of continuing education courses for nurses, including training programs for specialist nurses such as CCU nurses and nurse practitioners;
    - g. Formalized initiative to bring practice of nursing and nursing education together in order to develop the kinds of curricula needed to train nurses for new and emerging nursing roles.
4. Encourage Projects in:
    - a. Innovative ways to encourage trained nurses to reenter the nursing market (such as part-time work arrangements, experimental salary and working condition incentives, etc.)
    - b. Nursing career education stressing realistic job opportunities and conditions, aimed at age groups identified as having the highest probability to continue practice.

c. Innovative clinical training coordination and utilization projects;

d. Experimental pilot project utilizing nursing personnel in new roles with a stong evaluation component;

e. Nursing school applicant matching system.

5. Recommended Enrollment:

a. Maintain current Associate degree and Diploma nursing programs entering class enrollment at 5,000.(The 1975 Associate degree program admissions were 4,350 and the Diploma program admissions were 355.)

b. Increase the enrollment of the entering class of Baccalaureate degree students by 34.4% per year to 2,007 by 1980. (In 1975, there were 1,695 Baccalaureate degree admissions.)

c. Increase graduate enrollment by 20% to 800 students in order to increase the number of nurses with advanced training who are capable of assuming educational and administrative roles. (Approximately 400 professional nurses are receiving their graduate training in the two University of Calfiornia nursing schools and 268 in the California State University nursing schools.)

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VI. DENTISTRY

1. INTRODUCTION AND SUMMARY

California has five of the 58 schools of dentistry in the United States; the University of California at San Francisco (UCSF), the University of the Pacific (UOP), the University of California at Los Angeles (UCLA), the University of Southern California (USC), and Loma Linda University. These five schools enroll about 544 first-year dental students. No other state in the nation has this many dental schools and no other state enrolls as many first-year dental students. However, only 32.5% or 177 of the 544 first-year places are in state-supported schools. In 1975, 80% of the first-year places were occupied by California residents. With the current pattern of enrollment, it is likely that the number of graduates for each year during the next several years will be about 500 to 510 per year.

In a 1975 analysis of active non-federal dentists, it was established that approximately 62% had been trained in the state of California. The largest migration of dentists was from Illinois and Missouri with 7.3% and 4% respectively of California's dentists having been trained in those two states. The average age of dentists was quite young in 1975, at 43 years of age. The California Dental Association estimated that the number of dentists lost due to death, retirement or other factors would be about 3% per year.

At the present time, distribution of dentists in California is quite good, with only one rural county lacking at least one resident, licensed dentist as of 1975. There are still some population groups who do not have access to dental care for a variety of reasons--financial, cultural, and educational barriers prevent these groups from receiving adequate care. In 1973 a survey conducted by the California Dental Association (CDA) reported that only 5% of all dentists felt that they were too busy and would like fewer patients. Forty and three-tenths percent indicated that they were not busy enough and needed more patients. The majority of dentists also reported that they could accept almost all new patients. The findings of this survey indicate that increased productivity of dental manpower is possible, and could absorb a sizeable increase in demand should one occur. These findings should be of particular interest to those who are planning expansion of publicly-funded dental care services. It is anticipated that little or no dental care will be included under a national health insurance plan by 1980, and that the incremental increase of prepaid dental care programs currently occurring in California will place no undue stress on the dental manpower supply.

Dentistry is currently in a state of flux concerning the realignment of duties for dental auxiliaries. Recent legislation (AB 1455) and new regulations, which have yet to be implemented, have provided for a career ladder concept which expands the duties legally delegable to auxiliaries. The impact of this recent legislation has yet to be determined; although research in clinical settings has indicated that a substantial increase in productivity might result from utilization of expanded-duties auxiliaries.

No research has been conducted specifically to determine the optimal number of dentists for each specialty area who will be required to meet the demand and need for dental services in California. The CDA study showed that, on the whole, specialists are less busy than general practitioners. It can be concluded, then, that there are currently sufficient numbers of specialist dentists in the State to meet the demand and that it is not necessary to make a special effort to increase their numbers.

The State can expect even more recent manpower data to result from a survey to be conducted by the Board of Dental Examiners in March of 1976 as a part of the licensing renewal activities for all dentists and dental hygienists in California. The results of that survey in terms of distribution and other significant manpower information should be of great help to future planners. It is our understanding that such a survey will be a part of each subsequent two-year license renewal.

TABLE VI-1

U.S. SUPPLY OF ACTIVE DENTISTS AND DENTIST/POPULATION RATIOS

Actual 1970; Projected 1975-90

	1970		1975		1980		1985		1990	
	number	rate*	number	rate*	number	rate*	number	rate*	number	rate*
Basic methodology[1]	102,200	50.2	111,990	52.1	126,170	55.6	140,950	58.9	154,910	61.8

*rate per 100,000 population; based on U.S. Census Report and Projections, resident population:

1970 - 203,805,000
1975 - 214,883,000
1980 - 226,934,000
1985 - 239,329,000
1990 - 250,630,000

1 - assumes a stable first year dental school enrollment remaining at the projected 1978-79 level. (alternative methodologies caused only minimal changes in the projections and therefore are not shown)

Notes: Figures include all active dentists in the 50 States and the District of Columbia and Federal dentists abroad.

Projections include all dentists active on 12/31/70 plus the estimated number of graduates for the twenty-year period minus the estimated number of dentists lost due to retirement and death.

Source: The Supply of Health Manpower, 1970 Profiles and Projections to 1990, U.S. Department of Health, Education and Welfare, December 1974, chapter 5.

2. SUPPLY TRENDS AND PROJECTIONS

Licensure Data. It is estimated that there are currently 111,900 active dentists in the United States, or a ratio of 52.1/100,000. This supply is projected to increase to 126,170 in 1980 (a ratio of 55.6/100,000); 140,950 in 1985 (a ratio of 58.9/100,000); and 154,910 in 1990 (a ratio of 61.8/100,000), assuming a stable first-year dental school enrollment remaining at a projected 1978-79 level. The ratio of active dentists to population, which had edged up between 1960 and 1970, is projected to rise sharply in the future. The ratio is projected at 62/100,000 in 1990; this compares with a ratio of only 50/100,000 in 1970. (See Table VI-1).

Between 1965 and 1971, dental school enrollment rose at an average annual rate of about 3.6%. Construction provisions in the Health Professions Educational Assistance (HPEA) Act have had a noticeable impact. In 1960, a total of 47 dental schools were in operation. By 1975, a total of 59 schools were graduating dentists.(1)

TABLE VI-2

LICENSED DENTISTS IN CALIFORNIA BY COUNTY

TYPE--DENTISTS 12/30/75

Alameda	866	Placer	68
Alpine		Plumas	8
Amador	11	Riverside	269
Butte	60	Sacramento	464
Calaveras	9	San Benito	5
Colusa	6	San Bernadino	360
Contra Costa	492	San Diego	1,055
Del Norte	7	San Francisco	894
El Dorado	43	San Joaquin	183
Fresno	266	San Luis Obispo	81
Glenn	8	San Mateo	457
Humboldt	73	Santa Barbara	214
Imperial	24	Santa Clara	882
Inyo	8	Santa Cruz	121
Kern	145	Shasta	58
Kings	23	Sierra	2
Lake	19	Siskiyou	23
Lassen	9	Solano	110
Los Angeles	4,572	Sonoma	212
Madera	16	Stanislaus	130
Marin	220	Sutter	30
Mariposa	5	Tehama	13
Mendocino	42	Trinity	9
Merced	51	Tulare	97
Modoc	4	Tuolumne	24
Mono	1	Ventura	255
Monterey	204	Yolo	51
Napa	71	Yuba	12
Nevada	34	Out of State	2,621
Orange	1,126	Out of Country	188
		Prefix Count	17,331

SOURCE; Board of Dental Examiners.

The California Board of Dental Examiners reported 17,331 licensed dentists as of December 30, 1975; of which 2,621 were out of state, and 188 were out of country, leaving a remainder of 14,522 active and inactive licensed dentists residing in the State. It should be noted that 4,572 or 31.5% of all licensed dentists are located in Los Angeles County and 894 or 5.2% are located in San Francisco County whereas Alpine County has no licensed dentists in residence. (See Table VI-2)

TABLE VI-3

ESTIMATED NUMBER OF ACTIVE DENTISTS, CIVILIAN POPULATION, DENTIST TO POPULATION RATIO CALIFORNIA, 1950 - 1985

YEAR	TOTAL CIVILIAN POPULATION(1)	ACTIVE CIVILIAN DENTISTS(2)	PERCENT INCREASE FROM PREVIOUS PERIOD		DENTISTS PER 100,000 POPULATION
			POPULATION	DENTISTS	
1950	10,586,000	6,144	-	-	58.0
1960	15,717,000	8,521	48.4	38.7	54.2
1965	18,299,000	9,028	16.4	6.0	49.3
1970	19,953,000	11,466	9.0	27.0	57.5
1975	20,931,000	12,530	4.9	10.0	59.9
1980	22,384,000	13,625	6.9	8.7	60.9
1985	24,088,000	14,667	7.6	7.6	60.9

SOURCE: California Dental Association Study.

According to the California Dental Association, however, the dentist-to-population ratio in California in 1975 is only slightly better than it was in 1950; and it is predicted to change little in the next decade. In 1950, there were about 58 dentists for every 100,000 population; in 1975, the ratio is estimated to be 59.9 (See Table VI-3). The number of dentists in proportion to population, dropped to its lowest point in 1965 when it was estimated to be 49.3. The population increase that occurred between 1950 and 1965 was not matched by a similar increase in the number of dentists. In the decade 1965 to 1975, however, the rate of increase for the number of dentists exceeded that of population, and it is predicted that this situation will continue for the next few years, but at a rate much closer to that predicted for population increases. From 1980 to 1985, it is estimated that the increase in the number of dentists will match the estimated increase in the population of the State.

Estimating the probable number of dentists who will be in active practice ten years from now is a risky undertaking at best. Many factors influence the size of a health professional work force in any state, and most of them are relatively unpredictable beyond the next year or two. An estimate of the future dental work force in California is solely dependent upon the assumptions that one is willing to make about the size of the increases and the size of the decreases that will occur from any given point in time forward into the future. Projections in this report are based upon three major assumptions: 1) That the number of dentists who will die or retire or otherwise leave the work force will be about 3% per year. 2) That the number of dentists each year who will receive licenses to practice in California will increase only slightly over the next decade, and

TABLE VI-4

ESTIMATED NUMBER OF ACTIVE DENTISTS
CALIFORNIA
1975 - 1985

YEAR	ESTIMATED NUMBER OF DENTISTS JULY 1	ESTIMATED LOSS FROM DEATH AND RETIREMENT	ESTIMATED NUMBER, NEW LICENSEES	
			TOTAL	PRACTICING IN CALIFORNIA
1975	12,530	376	710	596
1976	12,750	382	720	605
1977	12,973	389	725	609
1978	13,193	396	730	613
1979	13,410	402	735	617
1980	13,625	409	740	621
1981	13,837	415	745	626
1982	14,048	421	750	630
1983	14,257	428	755	634
1984	14,463	434	760	638
1985	14,667	-	-	-

SOURCE: California Dental Association Study.

3) That the proportion of dentists who receive a California license and elect to remain in the state and practice and eventually retire will average 84% as it appears to be for the current work force. Given this firm foundation of quicksand, estimating the future dentist work force in California becomes an exercise in faith and arithmetic and the results are reported in Table VI-4. While it appears unlikely that the rate of leaving the work force because of death and retirement or other reasons will change substantially in the near future, the same circumstance may not apply to the number of dentists entering the California dentist work force in future years. Changes in licensing reciprocity practices, whether accomplished by agreement among states or by future federal legislation could make a substantial difference in the number of new licenses to practice in California that will be granted in future years. Changes in licensing procedures or requirements could also affect the predicted number of new licensees.

The number of new dental licenses issued each year by the California Board of Dental Examiners has about doubled since 1950 (See Table VI-5, next page) In comparing the year 1950 to 1960, the number of licenses issued each year increased by 48%, about the same rate of increase as the population in the State.(See Table VI-3) For the years 1960 to 1965, the increase was about 42% while population growth during this period was about 16%. During this period, a larger proportion of new licenses were issued to "past graduates." In 1966, about one half of the licenses were to past graduates, the highest point reached in recent years. This proportion has been relatively stable since 1965, varying between 35% and 45% except for 1974, when only 27% of the new licensees were past graduates.

TABLE VI-5
ESTIMATED NUMBER OF DENTISTS' LICENSES ISSUED BY THE CALIFORNIA BOARD OF DENTAL EXAMINERS
1950 - 1975

YEAR	ESTIMATED LICENSES ISSUED	CURRENT GRADUATES	PAST GRADUATES	
			NUMBER	PER CENT
1950	299	222	77	25.8
1960	443	281	162	36.6
1965	628	340	288	45.9
1966	525	322	267	50.9
1967	488	288	200	41.0
1968	617	350	267	43.3
1969	674	376	298	44.2
1970	687	413	274	39.9
1971	7[illegible]7	461	296	39.1
1972	696	452	244	35.1
1973	711	429	282	39.7
1974	733	536	197	26.9
1975	710	(a)	(a)	(a)

(a) Data not available.

SOURCE: California Dental Association Study.

The number of current graduates issued a new license by the California Board of Dental Examiners has more than doubled since 1950. (Table VI-5) "Current graduates" are usually those that graduated from dental school in the same year they were granted a license, but a few graduates of the previous calendar year are also included. "Past year" graduates are all other dentists who receive a license. This group tends to be dentists graduated more than two years ago who are licensed and practicing in other states or who are in the Armed forces. A few in this group may also be graduates of California dental schools who had not been granted a license in the year of graduation or the calendar year immediately following graduation. The "current graduate" group is primarily graduates of California dental schools. Some non-resident graduates who will later practice in other states are included as well as some California residents, who graduated from dental schools located outside of the State and wish to return home to practice.

TABLE VI-6
NUMBER AND PERCENT OF
LICENSES ISSUED TO CURRENT GRADUATES
CALIFORNIA DENTAL SCHOOLS
1970 - 1975

YEAR	ESTIMATED LICENSES ISSUED	CURRENT GRADUATES			PAST GRADUATES
		CALIFORNIA SCHOOLS		OTHER SCHOOLS	
		NUMBER	PERCENT		
1970	687	349	50.8	64	274
1971	757	380	50.2	81	296
1972	696	402	57.8	50	244
1973	711	378	53.2	51	282
1974	733	496 (a)	67.7	40	197
1975	710	(b)	(b)	(b)	(b)

SOURCE: California Dental Association Study.

(a) In calendar year 1974, the University of the Pacific Dental School graduated 2 classes while changing the 36-month curriculum to a 3-year period.

(b) Data not available.

In most states in the nation, a major factor influencing the supply of dentists is the number of new graduates of dental schools located within the states. In California, this factor is of relative less significance since the State attracts many dentists who graduated from schools located outside of the State. In recent years, between 50% and 60% of the new licenses issued were granted to current graduates of California dental schools. (See Table VI-6)

TABLE VI-7

1975 ACTIVE DENTISTS IN CALIFORNIA BY STATE OF GRADUATION

State of Graduation	% of Dentists
California	61.8
District of Columbia	1.7
Illinois	7.3
Michigan	1.6
Minnesota	1.8
Missouri	4.0
Nebraska	2.4
New York	1.2
Ohio	2.5
Oregon	2.4
Pennsylvania	2.6
Wisconsin	1.7
Foreign Countries	1.4

Source: American Dental Association

Migration. It should be noted that not all current graduates of California schools will remain in the State to practice dentistry. In 1974, for example, the graduates of California dental schools took license examinations in 21 other states and some participated in regional examinations held in other parts of the country. About 15% of the licenses received by the 1974 graduates of California schools were granted by the examining boards of states other than California. It can be speculated that most of the current graduates of schools located outside of California have some intent to practice in the State immediately or at some time in the future. Many of this group are probably California residents who received their dental education out of state.

Most of the "past graduates" are graduates of dental schools located outside of the State and are probably practicing in another state. In 1972, 23 of the 244 past graduates licensed were graduates of California dental schools, and the balance were graduates of schools in other states. More recent data about this group are not available.

California dental schools are not graduating enough dentists to maintain the current dentist-to-population ratio. A key determinant in the dentist supply for the State has been, and will probably continue to be, the number of licenses issued each year to both the current and past graduates of dental schools located out of the State.

The major supply states of dental graduates to California are Illinois, Missouri, Pennsylvania, Ohio, Oregon, and Nebraska. A total of 36.8% of all California dentists migrates from other states with only 1.4% from other countries. (See Table VI - 7)

TABLE VI-8

D.D.S. DEGREES CONFERRED BY CALIFORNIA DENTAL SCHOOLS 1966-75 AND PROJECTED FOR 1976 and 1977

SCHOOL											Projected	
	65 66	66 67	67 68	68 69	69 70	70 71	71 72	72 73	73 74	74 75	75 76	76 77
UCSF	72	70	68	71	73	74	72	68	77	73	87	87
UCLA	--	--	27	26	74	92	91	90	93	99	100	101
USC	94	82	101	107	118	113	121	130	124	122	138	132
UOP	40	46	58	55	61	79	93	97	191*	119	129	135
LOMA LINDA	41	57	55	59	59	64	56	64	69	120*	73**	73
TOTAL	247	255	309	318	385	422	433	449	554	533	527	528

* an additional class graduated due to an acceleration of time usage

** an additional 15 students are anticipated to graduate in 1976 at Loma Linda.

Compiled from data submitted to the California Study Office by Individual Dental Schools, Fall and Spring 1976.

Enrollment Data. According to the Annual Report on Dental Education published by the American Dental Association (ADA) in 1972, the future supply of dentists largely reflects the growth of enrollments in dental schools. From 1953 through 1964, the average annual rate of increase was only 1.2%. From 1965 to 1971, however, dental schools experienced an increased growth rate, an annual average of 3.6%. This increase was no doubt due to the impact of new federal support during this period. The total number of students enrolled increased 27% in a decade.

The pattern of degrees conferred by the five California dental schools (UCSF, UCLA, USC, UOP, and Loma Linda) during the last ten years can be seen in Table VI-8 . This table shows an increase of 115.6% in the number of graduates at the five California schools between 1966 and 1975.

Projected Supply and In-Migration of Dentists. A detailed description of the methodology for projecting the future supply of dentists in California is described in Appendix D, together with a base case projection in which observed past patterns and trends are assumed to continue into future years. In this projection methodology, estimates are made of expected losses or attrition in the existing (1975) supply of dentists as are expected gains or additions from new California graduates and new in-migrations. A summary of base case projection is shown in Table VI-9, below.

TABLE VI-9
BASE CASE PROJECTION OF CALIFORNIA DENTISTS (2)

	1975	1980	1985	1990
Total Licensed	14,522	16,729	19,067	21,324
Total Active	12,529	14,433	16,451	18,398
California Graduates + 1975 Supply	7,747	8,852	9,992	11,078
U.S. Graduates	4,610	5,379	6,225	7,055
Foreign Graduates	172	201	233	264
Dentists per 100,000	59	63	67	70

A. Educational Output

In this base case projection, it was assumed that the future rate of growth in California dentist education programs would be equal to the rate of growth for the United States, as estimated in reference 1. The annual rate of growth is as follows: .014 for the 1976-80 period, .000 for the 1981-85 period, and .000 for the 1986-90 period. These rates of growth were chosen to provide a basis of comparison with the results for the United States, as shown in Table VI-10, next page.

TABLE VI-10

COMPARISON OF UNITED STATES AND CALIFORNIA PAST AND BASE CASE PROJECTED FUTURE SUPPLY OF ACTIVE DENTISTS (2)

	United States*		California	
	Active Dentists	Dentists per 100,000	Active Dentists	Dentists per 100,000
1960	90,100	49	--	--
1970	102,200	50	--	--
1975	112,000	52	12,529	59
1980	126,200	56	14,433	63
1985	141,000	59	16,451	67
1990	159,900	62	18,398	70

*Source: The Supply of Health Manpower, 1970 Profiles and Projections to 1980, Department of Health, Education, and Welfare.

These results show that the basic methodology and base case projection described in Appendix D are consistent with the methodology and assumptions used in the national projection. The trend in the number of dentists in Califronia per 100,000 matches that projected for the U.S. very closely.

The actual rate of growth in future educational output of trained dentists in the state of California is, in fact, likely to depart from the national average and will be determined in part by state policy. However, as stated above, the methodology employed for projecting future supply can be used to examine the impacts of alternative assumptions. A complete description of the sensitivity analyses performed on the impacts of various assumptions is contained in Appendix D. A summary of the results of the impacts of changes in educational output considered in this appendix is shown in Table VI-11, next page.

TABLE VI-11

SENSITIVITY OF FUTURE DENTIST SUPPLY TO FUTURE CALIFORNIA EDUCATIONAL OUTPUT (2)

	Change in Growth Rate	1985 California Graduates		Active Dentists per 100,000	
		Number	Change	Number	Change
Base Case		9,992		67	
Alternative 1	+2.5%	10,271	2.8	68	1.5%
Alternative 2	+5.0%	10,593	6.0	69	3.0%
Alternative 3	_10.0%	11,371	13.8	73	9.0%

These results show, as would be expected, that the future California supply of dentists is quite sensitive to the rate of growth in educational output. Each percentage of increase in the growth rate relative to the base case rate produced about a 1.3% increase in the number of dentists per 100,000.

Table VI-11 also illustrates the significant implications for educational output requirements of changes in the target ratio of dentists per 100,000. The 1.5% increase in the ratio implies almost a 2.8% increase in the level of graduate output. Thus, each percentage change in the 1985 ratio corresponds to about a 1.9% change in output.

b. Migration

From past trends it was assumed in the base case projection that the in-migration rate of dentists trained outside the State would be equal to 5.9% of the total number trained in the United States each year and that the retention rate for California graduates was .58. As with the assumption on the rate of growth of graduate output, the methodology can also be used to examine the impacts of changes in migration patterns.

Consider, first, the in-migration rate. Table VI-12 shows the impacts of changes in the rate of inflow.

TABLE VI-12

SENSITIVITY OF FUTURE CALIFORNIA DENTIST SUPPLY TO FUTURE MIGRATION (2)

	In-Migration		1985 Active Dentists per 100,000	
	Rate	Change	Number	Change
Base Case	.0594		67	
Alternative 1	.0535	-10%	66	-1.5%
Alternative 2	.0446	-25%	65	-3.1%
Alternative 3	.0297	-50%	63	-6.3%

These results indicate that future supply is relatively insensitive to changes in the assumed rate of in-migration for the ranges considered.

Table VI-13 shows the impact of changes in the retention rate of California graduates on future supply. As can be seen from Table the 1985 active dentists per 100,000 ratio is also insensitive to the assumed rate of retention (of, conversely, the rate of out-migration) for the range of changes considered.

TABLE VI-13

SENSITIVITY OF FUTURE CALIFORNIA DENTIST SUPPLY TO THE RETENTION OF CALIFORNIA GRADUATES (2)

	California Graduate Retention		1985 Active Dentists per 100,000	
	Rate Rate	Change	Number	Change
Base Case	.854		67	
Alternative 1	.817	-5.0%	67	0.0%
Alternative 2	.769	-10.0%	66	-1.5%

TABLE VI -14

NUMBER OF APPLICATIONS, FIRST YEAR ENROLLMENT, AND GRADUATES, CALIFORNIA DENTAL SCHOOLS,

1950 - 1975

YEAR	FIRST YEAR ENROLLMENT		GRADUATES	
	NUMBER	PERCENT INCREASE	NUMBER	PERCENT INCREASE
1950	220	-	172	-
1960	296	34.5	255	48.2
1965	334	12.8	291	14.1
1970	465	39.2	384	32.0
1971	465	-	407	-
1972	536	-	435	-
1973	542	-	446	-
1974	549	-	554	-
1975	544	17.0 (a)	471	22.6 (a)

SOURCE: California Dental Association Study.

(a) 1975 data compared with 1970

Educational Opportunity

The number of first year enrollments in California dental schools has remained relatively unchanged in the last four years, and it is anticipated that it will change little in the next few years. In 1975, 544 first year students were enrolled in California dental schools and there were 471 graduates that year. (See Table VI-14). With the current pattern of enrollment, it is likely that the number of graduates each year during the next several years will be about 500 to 510. The increase in first year enrollment did not keep pace with population growth during the period 1950 and 1965. However, there was substantial growth in first year places between 1965 and 1970, and another increase between 1971 and 1972. In 1975, California dental schools provided 9.4% of the first year places for dental students in the nation. California's population in 1975 was estimated to be 9.7% of the total U.S. population.

TABLE VI-15
FIRST YEAR ENROLLMENT IN CALIFORNIA DENTAL SCHOOLS, BY RESIDENT STATUS OF STUDENT, AND SCHOOL

1970 and 1975

SCHOOLS	1970			1975		
	TOTAL	CALIFORNIA RESIDENTS	NON RESIDENTS	TOTAL	CALIFORNIA RESIDENTS	NON RESIDENTS
TOTAL	465	391	74	544	437	107
UNIVERSITY OF THE PACIFIC	100	81	19	138	112	26
UNIVERSITY OF CALIFORNIA SAN FRANCISCO	80	77	3	88	87	1
UNIVERSITY OF CALIFORNIA LOS ANGELES	97	89	8	106	93	13
UNIVERSITY OF SOUTHERN CALIFORNIA	120	111	9	139	101	38
LOMA LINDA	68	33	35	73	44	29

SOURCE: California Dental Association Study.

There are five dental schools located in California; University of California at San Francisco and University of California at Los Angeles are publicly owned and state tax supported; the other three are private schools. No other state in the nation has this many dental schools, and no other state enrolls as many first year dental students. However, only 177 of the 544 first year places are in state tax supported schools. (See Table VI-15) In 1970, 15% of the first year places were used by residents of other states and countries; by 1975, the proportion of first year places occupied by non-residents, had risen to 20%. Even though the first year capacity of the dental schools had increased by 79 places between 1970 and 1975, only 46 more California residents were enrolled in 1975. California's private dental schools increased their first year enrollment from 225 in 1970, to 288 in 1975 or by 63 first year places. About one half of this increased capacity was used in 1975 to enroll out-of-state students. In 1975, California's private schools enrolled 41 first year students from states without a dental school, 29 students from states with a dental schools, and 23 students from foreign countries. In 1974, California's five dental schools processed 10,433 applications for the first year places; in 1969, the number was 5,584 or an 87% increase in a five-year period. In 1975, about 60% of the applications filed with California's dental schools were from California residents; the balance were from residents of other states.

The data in Table VI-15 suggests that the State's continuing reliance on private schools, for the education of California residents who want to become dentists subjects the residents to heavy out-of-state competition, for scarce first year places. The recent increases in first year places

TABLE VI-16

NUMBER OF CALIFORNIA RESIDENTS APPLYING FOR AND ENROLLING IN DENTAL SCHOOLS 1969 and 1974

	CALIFORNIA RESIDENTS	
	1969	1974
APPLICANTS	1,173	1,977
APPLICATIONS	7,211	16,259
APPLICATIONS PER APPLICANT	6.2	8.2
FIRST YEAR ENROLLMENT TOTAL	505	565
IN-STATE PUBLIC SCHOOL	161	180
IN-STATE PRIVATE SCHOOL	240	254
OUT-OF-STATE SCHOOL	104	131

SOURCE: California Dental Association Study.

in the five dental schools have done little to assist the many qualified resident applicants seeking dental careers.

The number of California residents seeking a dental education has increased substantially in recent years. In 1974, 1,977 residents filed over 16,000 applications to various dental schools (See Table VI-16) Compared with 1969, the number of California applicants to dental schools has increased by 68%. In 1969, 43% of all California applicants subsequently enrolled in a dental school, with about one-fifth of them enrolled in out-of-state schools. In 1974, only 29% of the California applicants subsequently enrolled in a dental school, and 25% of those who did enroll were in out-of-state schools.

In 1974, about 60% of the applications filed by California applicants were to schools located outside of the State; on the average each applicant filed an application to 8 different dental schools (See Table VI-16). Even though applications by California residents made up 19.4% of the total applications filed by all persons to all U.S. dental schools, and California applicants made up 13.3% of all U.S. applicants, Californians occupied only 10% of the first year places in the nation's dental schools in 1974.

TABLE VI-17

FIRST YEAR (ENTERING CLASS) OF STUDENTS IN CALIFORNIA SCHOOLS OF DENTISTRY BY SEX AND ETHNIC ORIGIN, 1975

SCHOOL	ETHNIC ORIGIN					TOTAL	SEX	
	Asian American	Black	Caucasian	Chicano	Other*		M	F
UCLA	0	10	86	7	3	106	83	23
UCSF	21	2	49	12	4	88	78	10
Loma Linda	1	0	58	2	14	75	70	5
UOP	21	0	116	1	0	138	125	13
USC	15	5	90	6	-	116	102	14
Totals	58	17	399	28	21	523	458	65

* Includes Native Americans.

SOURCE: Compiled from data submitted to the California Health Manpower Study Office by individual schools, Spring 1976.

Ethnic minority representation of the student body in the entering classes consists of 194 minority students or 30.4% of the state-supported schools and 329 minority students or 22.7% of the private schools.

Dental schools enroll a larger percentage of Asian American students than any other minority group which is also typical in the other health science areas studied.

U.C.S.F. has the highest ethnic minority representation in its entering class with 39 students or 44.3% while the University of the Pacific has the lowest with 26 students or 15.9%.

Female students represent 12% of all entering class students in dentistry. U.C.L.A. has the highest female student ratio--27% of its entering class. (See Table VI-17)

3. DEMAND AND PROJECTIONS

While considerations relating to the overall supply of dentists now and in the future are important elements to planning for dental health manpower, the location of dentists in relation to the population they serve are of equal importance. For this analysis, the newly established Health Service Areas for California were selected to describe the current distribution of dentists and to forecast the numbers of dentists needed to serve the population in the future.

The requirements for the location of dentists are substantially different than the requirements for the location of physicians or emergency medical care personnel. Dentistry is seldom a life-threatening disease requiring immediate attention. With the exception of certain types of trauma, infection, or toothaches, most dental care can be postponed for a day or a few days, or until the person will be near a dentist because of a shopping trip or other travel. The geographic area for dental manpower planning then, is not the neighborhood where the person lives or even the city or small town, but rather the major shopping center or area of a city or of a rural county. *Where there are population groups not receiving the dental care they need, the solution is often one of transportation to the nearest dentist and/or money to pay for care when it is given.* While the ratio of dentist per 100,000 population has some usefulness in describing the total dental manpower need of a state like California, its usefulness is more limited for smaller geographic areas. These rates provide only a clue to the existence of geographic maldistribution; from then, one cannot conclude that action needs to be taken nor can the causes of maldistribution be determined.

TABLE VI-18

ESTIMATED NUMBER OF ACTIVE DENTISTS/100,000 CIVILIAN POPULATION BY HEALTH SERVICE AREA(1), CALIFORNIA, 1975

Health Service Area	Estimated Active Dentists	Estimated Civilian Population	Active Dentists / 100,000
State Total	12,530	20,931,000	59.9
1. Northern California	312	552,500	56.5
2. Sacramento - Yolo	611	1,057,400	57.8
3. Sonoma - Solano - Napa	340	509,500	66.7
4. S.F. - San Mateo - Marin	1,354	1,449,200	93.4
5. Alameda - Contra Costa	1,175	1,687,400	69.6
6. San Joaquin - Stanislaus	348	693,200	50.2
7. Santa Clara	762	1,207,600	63.1
8. Monterey - Santa Cruz	353	544,500	64.8
9. Fresno - Kern	479	1,112,300	43.1
10. Santa Barbara - Ventura	405	718,000	56.4
11. Los Angeles	3,945	6,900,300	57.2
12. San Bernardino - Riverside	544	1,242,900	43.8
13. Orange	969	1,700,900	57.0
14. San Diego - Imperial	933	1,555,300	60.0

(1) Health Service Areas were established in September 1975 by the Department of Health, Education, and Welfare in accordance with P.L. 93-641, (1-4-75).

Source: California Dental Association

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While the state average dentist population ratio in 1975 was 59.9, this figure varied form 43.1 to 93.4 among the various Health Service Areas (HSA). Eight of the fourteen areas, however, were 33% of the state's population lives, had ratios between 54.9 and 64.9, close to the state average. More than half of the people of the State (52%) live in health service areas with a ratio of 65.0 dentists per 100,000 population or more. Only 15% of the state's population lives in the three health service areas with a ratio below 54.8. Health Service Area 9, the southern portion of the central valley, had the lowest ratio in the State, 43.1. If this California Health Service Area is compared with other states in the nation, 24 states, (where 37% of the U.S. population lives) had dentist population ratios in 1973 that were below this HSA. Although this comparison with national data appeared relatively favorable for California, it should be pointed out that there are four states in the country—Connecticut, New York, Oregon, and Washington—and the District of Columbia, that have a dentist-to-population ratio that exceeds California's. And two states—Massachusetts and Hawaii—have ratios that are approximately the same. Only the San Francisco HSA exceeds New York's overall ratio of 72, and the District of Columbia's of 77. If the San Francisco Area and the Alameda / Contra Costa HSA were combined to represent the urban commuting/shopping area, the rate would be approximately 81 per 100,000. (See Table VI-18)

TABLE VI-19
ESTIMATED NUMBER OF DENTISTS NEEDED BY 1980

	Health Service Area	Estimated Number of Dentists '75	Loss[1] Due to Retirement & Death, 1975-80	Estimated Population[2] 1980	Dentists Needed By 1980[1]	New Dentists Needed By 1980(2)
	State Total	12,530	-	22,384,000	14,190	-
1.	Northern California	312	48	603,100	361	97
2.	Sacramento - Yolo	611	95	1,166,600	699	183
3.	Solano - Napa - Sonoma	340	53	585,400	390	103
4.	S.F. - San Mateo - Marin	1,354	210	1,475,100	1,378	234
5.	Alameda - Contra Costa	1,175	182	1,778,300	1,238	245
6.	San Joaquin - Stanislaus	348	54	756,200	453	159
7.	Santa Clara	762	118	1,337,400	844	200
8.	Monterey - San Luis Obispo	353	55	618,800	401	103
9.	Fresno - Kern	479	74	1,185,600	710	305
10.	Santa Barbara - Ventura	405	63	817,600	490	148
11.	Los Angeles	3,945	611	6,939,000	4,156	362
12.	San Bernardino - Riverside	544	84	1,371,900	822	362
13.	Orange	969	150	1,959,400	1,174	355
14.	San Diego - Imperial	933	145	1,789,600	1,074	286

(1) Number needed to maintain the 1975 Dentist/Population ratio or to increase it to 59.9 if it was below that.

(2) Number of new dentists needed in an area to replace losses due to death and retirement, and maintain the current ratio or improve it 59.9 (the State Average).

Source: California Dental Association

Each Health Service Area in the State is faced with the need to replace dentists retiring or dying in order to at least maintain the current capacity for dental services. In addition, areas where population growth will continue in the next decade, need to insure that additional dentists will be available to care for the increased population. Some Health Service Areas appear to need additional dentists to improve the supply for the population. It was estimated that about 36,000 dentists will be licensed in the next five years and about 3,000 of these will be entering practice in the State. Table VI-19 was designed to give clues to where they may be needed as replacements or to provide services for anticipated population growth or to improve the dentist-population ratio to at least the State average of 59.9 per 100,000 in those Health Service Areas that were estimated to be below the State average.

Using the assumption that no Health Service Areas should have a lower dentist/population ratio in the future than currently exists, and that areas below the State average should increase the supply to the State average, it was estimated that California would need about 14,190 dentists by 1980, about 565 short of the anticipated supply estimated in Table VI-3 for that year for the State as a whole. Even with this shortage, only about 800 of the new dentists who will be entering practice in the State would need to practice in the three Health Service Areas that are substantially below the State average in order to bring those three up to the average by 1980.

TABLE VI-20

DENTISTS' RESPONSES ON PRACTICE BUSYNESS(1)

Type of Dentist	Too Busy	About the Right Number	Not Busy Enough
TOTAL in Clinical Practice	5.0%	54.7%	40.3%
General Dentistry	5.7	56.3	38.0
A Specialty	2.2	47.6	50.2
GENERAL DENTISTS:			
Solo Practice	5.3	56.9	37.8
Partnership or Group	5.7	51.5	42.8
Professional Corporation	6.1	61.8	32.1
SPECIALTY DENTISTS:			
Solo Practice	1.5	43.3	55.2
Partnership or Group	2.2	49.5	48.3
Professional Corporation	2.6	53.1	44.3

(1) Excludes the dentists who did not answer this question.

Source: California Dental Association Journal, April 1975, page 21.

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It is interesting to note that over one-half of the new dentists will be needed in urban areas of Los Angeles and Orange County and in the two Health Service Areas of the San Francisco Bay Area.

The geographic distribution of dentists cannot be examined solely from the statewide statistical point of view. Inevitably, the question of patient demand and patient utilization of services within an area must be examined and the results considered in planning. It needs to be underscored that "access to a dentist" and "access to dental care" are not the same thing. Most people in California (about 91% in 1970) live in urban areas. Only a few are many miles from the nearest dentist's office; however, in every Health Service Area in California, including those with the highest dentist/population ratio, there are large population groups who do not have access to dental care for a variety of reasons--financial, cultural and educational barriers keep people from going to a dentist.

The key health manpower planning problem for dentistry in California is probably not the total supply of dentists within the State nor does it appear to be primarily the distribution of dentists among the HSA's of the State. In some areas, it might be the distribution of dentists within the Health Service Area; only local study and analysis can determine this. The primary health planning problem of dentistry in California is to develop and test strategies for removing the financial, cultural, and educational barriers for groups within each Health Service Area who are not currently receiving adequate dental care.

The California Dental Association, in 1973, conducted a survey of all dentists licensed in California to determine both manpower distribution and gain realistic perceptions of the extent of dentist busyness at that time.(3)

The data indicates that only 5% of all dentists in clinical practice felt that they were too busy and would like fewer patients, 54.7% indicated that they "had about the right number of patients", and 40.3% indicated that they were "not busy enough and needed more patients". (See Table VI-20, previous page)

TABLE VI-21
DENTISTS' RESPONSES ON THE ADEQUACY OF THE DENTIST MANPOWER IN THEIR GEOGRAPHIC AREA (1)

Type of Dentist	Not Enough Dentists	About the Right Number	Too Many Dentists
TOTAL in Clinical Practice	3.4%	56.8%	39.7%
General Dentistry	3.8	57.8	38.4
A Specialty	2.1	53.0	44.9
GENERAL DENTISTS:			
Solo Practice	3.5	57.1	39.3
Partnership or Group	3.2	57.6	39.8
Professional Corporation	3.6	61.6	34.8
SPECIALTY DENTISTS:			
Solo Practice	2.2	50.7	47.1
Partnership or Group	0.7	58.8	40.5
Professional Corporation	1.6	51.9	46.5

(1) Excludes the dentists who did not answer this question.

Source: California Dental Association Journal, April 1975, page 24.

The results for the question of adequacy of dentist manpower showed that nearly 40% of the responding dentists felt that there were too many dentists in their undefined "geographical area". Nearly 45% of those limiting their practice to a specialty felt that there were too many dentists. (See Table VI-21)

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The third question in the study asked whether the dentist accepted new patients. Only 10% of the general dentists in the State reported that they accept no new patients. The majority of dentists reported that they accept almost *all* new patients. (See Table VI-22)

TABLE VI-22

DENTISTS' RESPONSES ON ACCEPTING NEW PATIENTS(1)

Type of Dentist	Accept a Few or No New Patients	Accept Most New Patients	Accept Almost New Patients
TOTAL in Clincal Practice	9.5%	19.6%	70.9%
General Dentistry	10.9	21.9	67.3
A Specialty	2.9	10.0	87.1
GENERAL DENTISTS:			
Solo Practice	13.0	23.2	63.9
Partnership or Group	6.8	18.8	74.4
Professional Corporation	5.5	20.8	73.7
SPECIALTY DENTISTS:			
Solo Practice	3.7	10.8	85.5
Partnership or Group	2.9	9.9	87.2
Professional Corporation	1.3	8.5	90.2

(1) Excludes the dentists who did not answer this question.

Source: *California Dental Association Journal*, April 1975, page 26.

The findings of this study suggest that increased productivity of dental manpower is possible and could absorb a sizable increase in demand should it occur. This finding should be of particular interest to those who are planning expansion of publicly-funded dental care services.

The State can expect even more recent manpower data to result from a survey that the Board of Dental Examiners will be conducting in March of 1976, as a part of the license renewal activities for all licensed dentists and dental hygienists in California.(4)

It should be remembered by readers that background knowledge in manpower planning for other health professions, is not directly applicable to dentistry, since dentistry is almost entirely practiced in a non-institutional setting. While a reasonable number of dentists do participate in hospital activities, and serve on hospital staffs, the great bulk of practitioners serve in small offices. In fact, 59% of the individuals responding to the CDA manpower survey indicate that they are self-employed dentists in a solo office. The remaining 40% are individuals in a partnership or a professional corporation.(3) In addition, the public's perception of dentistry is unfortunately one of an "optional health care service". Because of a number of factors--financial, cultural, educational,etc.-the rate at which individuals utilize dental services varied widely. (5 & 6) The growth in prepaid dental programs has encouraged greater utilization of dental services. Only at the outset of such programs, however, does the utilization rate come close to matching the need for services as perceived by the profession. After this first surge, demand stablizes at a lower level.(7)

Furthermore, dentistry is currently in a state of flux concerning the realignment of duties for dental auxiliaries. Recent legislation (AB 1455) and new regulations which have yet to be implemented, have provided for a career ladder concept, which expands the duties legally delegable to auxiliaries.(9) The impact of these recent developments had yet to be determined, although research studies in clinical settings have indicated that a substantial increase in productivity might result from utilization of expanded-duty auxiliaries.(9,10) Some very effective research tools, specifically a productivity index, and dental demand index are currently under development by the Leonard Davis Institute, acting under a grant from the American Dental Association. These research tools, once developed, will provide a firm base for data collection from throughout the United States and will provide a greater degree of comparability and a more accurate picture of the supply/demand factors in operation than data currently available.

It is important for anyone entering into an evaluation of the dental health manpower conditions in California, to distinguish very carefully between "need" (the services that the professional experts have determined are appropriate to good dental health), and "demand" (the care that people desire for which they are willing to pay). While changing economic conditions such as a prepaid dental care program or increased educational programs in the schools may change utilization rates, it is important to understnad that factors other than fiscal, come into play in the determination of when "need" turns into "demand".(11,12) *To plan to meet the need without turning the need into a demand would result in unsupportable oversupplies of personnel.*

The Impact of National Health Insurance. While recognizing the need for planning for National Health Insurance (NHI), it is certainly unclear today in the existing legislative climate whether or not a national health insurance program will be implemented by 1980, or if implemented, what form it will take. It appears likely that the initial program may not include any dental services other than payment for those services that can be equally supplied by a dentist, usually an oral surgeon, or a plastic surgeon.

It is anticipated that there will be a continuing increase in the number of individuals who are enrolled in private dental health insurance plans. Between 1967 and 1973, the percentage of the national population which had private prepaid dental care programs, increased from 2.4% of the population to 10.4%.(13) In California, where contracts for prepaid dental care have been written for at least 20 years, better than 40% of the population is currently covered by some form of prepaid dental care program.(7) Existing manpower supplies have absorbed the increased workload, resulting from outside funding of care, without any significant stress.(3) It can be expected that the incremental increases in prepaid dental care programs can be similarly absorbed by the profession, given its normal growth rate. In fact, at current rates, the data indicates that when current class sizes are maintained, the number of dentists per 100,000 population will increase from 59.1% in 1975 to 60.2% in 1985.

In addition, the real impact of the availability of expanded-duty dental auxiliaries is uncertain. But a study completed in 1970 indicated substantial increases in productivity by dentists making use of then existing categories of auxiliary personnel, starting with a 36% increase in productivity with the addition of just one full-time dental assistant up to 144% increase in productivity for dentists employing one full-time assistant, and one full-time secretary.(13) Experience with prepaid dental care programs has shown that when a new program is written for a group, the utilization rate of that group goes up substantially in the first part of the contract, but then levels off.(7) It would be poor planning to increase the manpower supply to meet the peak need by increasing the number of fully trained dentists (whose education is extremely expensive) rather than providing for absorbing the sudden increases through the use of auxiliary personnel.

It should be noted that the cost of training an expanded-duty dental auxiliary which takes two years instead of four, costs far less than the training of a dentist. More training programs are then available in areas where more demand is indicated. It would be important, however, to study the turnover rate and/or the lifetime of service for dental auxiliaries as compared to dentists.

In short, then, it is anticipated that little or no dental care will be included under National Health Insurance by 1980 and that the incremental increases in prepaid dental care programs currently occurring in California have placed no undue stress on the dental manpower supply.

4. TRENDS IN UTILIZATION PATTERNS

Specialization. An important trend in the delivery of dental care has been the rate of increase in the number of dentists who have obtained specialized training (endodontics, oral pathology, oral surgery, orthodontics, pedodontics, periodontics, and prosthodontics) beyond the D.D.S. degree. Nationally the number of dental specialists has increased threefold from 1955 to 1970. In 1970, there were approximately 10,315 dentists recognized by the American Dental Association as specialists out of a non-federal dentist labor force of 90,829.

Although there is no licensing of dental specialists in California, the latest data available from the American Dental Association (ADA) indicates that California has the highest specialist-to-population ratio in the U.S.(14)

A survey was conducted by the California Dental Association in 1974 using an address list provided by the State Board of Dental Examiners. Of the 8,747 respondents (66% of the total licensed dentists), 682 reported that they were retired from active clinical practice, 132 reported that they were in full-time teaching or research, 150 were in a branch of the military, 97 were students, and 167 were in occupations other than dentistry or were out of the State. Eighty-six percent (7,516) of those responding stated that they were currently engaged in the clinical practice of dentistry. About 80% of this group said that they practiced general dentistry, and about 20% said that they limited their practices and/or were Board Diplomates in one of the specialties.

Several questions on the survey dealt directly or indirectly with practice busyness. Of the specialty dentists engaged in solo practice, only 1.5% said they were too busy and desired fewer patients while 55.2% stated they were not busy enough and needed more patients. Specialty dentists in partnerships and group practices or professional corporations were little better. They reported 48.3% and 44.3% of them, respectively were not busy enough and needed more patients. The California Dental Association study shows that, on the whole, specialists are less busy than general practitioners.(3)

No research studies have been specifically conducted to determine the optimal number of dentists for each specialty area who would be required to meet the demand and need for dental services in California.

It can be concluded that there are currently sufficient numbers of specialist dentists in California to meet the demand for services, and that it is not necessary to make a special effort to increase their numbers.

Increased Productivity with Expanded-Duties Auxiliaries. The productivity of dentists can be increased by increasing the number of hours and weeks they work per year, utilizing advanced technology and equipment, or by increased usage of dental auxiliaries.

The "American Dental Association Survey of Dental Practice 1971" reported that the average number of hours worked by dentists dropped steadily each year to 1950 hours/year in 1970.(16) Technology has increased productivity by the development of equipment that cuts the time necessary for certain procedures.

Paul J. Feldstein in his 1973 book, Financing Dental Care: An Economic Analysis, suggests that dentists can substantially increase their productivity by as much as 600 to 800 patient visits per year by adding auxiliaries.

In the 1971 "Survey of Dental Practice", the ADA prepared a table that relates the productivity of dentists to the number of auxiliaries employed.

Table VI-23 shows that as dentists increase their utilization of auxiliaries, their output also increases, as well as the dollar amount of dental care provided.

TABLE VI-23

PRODUCTIVITY OF DENTISTS BY NUMBER OF AUXILIARIES EMPLOYED

Number & Type of Auxiliaries	Amount of Care Provided*	Productivity Index
No employees	$31,128	100.0
One p-t assistant	33,832	108.7
One f-t assistant	42,406	136.2
One f-t assistant, one p-t assistant	46,640	149.8
One f-t assistant, one p-t hygienist	50,540	162.4
One f-t assistant, one f-t secretary	57,693	185.3
One f-t assistant, one f-t hygienist	61,306	196.9
Two f-t assistants	61,930	199.0
One f-t assistant, one f-t secretary, one p-t hygienist	62,485	200.7
One f-t hygienist, one f-t assistant, one f-t secretary	76,096	244.5
Five or more f-t auxiliaries; 0, 1, or more p-t auxiliaries	105,532	339.0

* Amount of Dental Care Provided is what the mean gross income would have been if fees had been equal to the national average. It is calculated by dividing the actural mean gross income by the composite fee index.

Source: "Survey of Dental Practice, 1971", conducted by the Bureau of Economic Research and Statistics, American Dental Association. Unpublished and undated mimeograph.

California is currently in the process of implementing recent legislation. Assembly Bill 1453 authorizes the Board of Dental Examiners to develop regulations creating new categories of dental auxiliaries personnel. This legislation, co-sponsored by the CDA, includes a career ladder concept and five categories of dental auxiliaries.(8)

The regulations dealing with dental assistants (who can be trained on the job) and registered dental hygienists have already been implemented.

The category of registered dental assistant requires that individuals desiring to be registered dental assistants pass an examination, and meet certain educational requirements. The examination is currently being developed by the Board of Dental Examiners. Regulations have not yet been drafted for registered dental assistants in extended functions or registered dental hygienists in expanded functions.

The impact of the legislation and regulations dealing with expanded duties for dental auxiliaries, of course, cannot yet be ascertained. Of all the research done nationwide, only one study dealt with the utilization of these auxiliaries in a private office setting.(16) Obviously a great deal more evaluation needs to be performed. It can, however, be anticipated that increased productivity will result. In all instances, the individual auxiliary categories function under the supervision of a licensed dentist.

The dental profession has also urged utilization of dental auxiliaries to implement a preventive dental care program in the school system, as a more effective way of dealing with dental disease, on a cost-effective basis. Before any further expansion of auxiliary duties occurs, it is important to evaluate and consolidate the information available on the results of any productivity increases from the current expansion, particularly since it does not seem that there will be a significant increase in demand for dental services over the next five years.

All dental hygienists practicing in the United States are licensed, a situation uncommon among allied health professions and occupations. The number of active dental hygienists is projected to grow from 15,100 in 1970 to 57,650 in 1990, or an increase of 280%. This estimate appears to be reasonable in view of the noticeable growth in the number of programs and graduates over the past few years. (1) (See Table VI-24, below)

TABLE VI-24

ADDITIONS & LOSSES TO THE SUPPLY OF ACTIVE FORMALLY-TRAINED DENTAL HYGIENISTS: 1970 AND PROJECTED 1975-80

Year	Number of Active Formally-Trained Dental Hygienists	Interval	Additions: Graduates of Approved Programs	Losses: Deaths & Retirements
1970	15,100	1970-75	16,800	8,590
1975	23,310	1975-80	22,710	11,830
1980	34,190	1980-85	27,180	15,040
1985	46,320	1985-90	28,410	17,080
1990	57,650	-	-	-

Source: The Supply of Health Manpower: 1970 Profiles and Projections to 1990. Dept. of Health, Education, and Welfare, December 1974.

The answers to the earlier questions have indicated that there is no substantial need for additional State-funded programs to train either dentists or auxiliaries. The resources of the existing auxiliary training programs will be best utilized by training at least a portion of their student bodies in expanded duties to meet some of the marketplace requirements and thereby increase the productivity of the dental office. A potential short-term program might be appropriate to provide continuing education for existing auxiliaries, to train them to provide expanded-duty functions. The administrators of the present dental schools and auxiliary training programs have indicated that they are preparing such programs and can implement them as soon as the structure and requirements of the regulations of the Board of Dental Examiners are finalized.

In December 1975, a number of experimental health manpower pilot projects (AB 1503) were under review. These include:

1. Citrus College - "Dental Auxiliaries Expanded Role Project"
2. Los Angeles City College - "Dental Assistant Educators Project"
3. University of the Pacific Dental School - "Dental Assistant Quality Evaluation Project"

The approved projects for expanded duty training include:

1. Loma Linda University School of Dentistry - "Expanded Duties for Hygienists Project"
2. Mt. Zion Hospital and Medical Center - "Curriculum Development for Expanded Duties Project"
3. University of Southern California - "Expanded Role Dental Auxiliaries Project"
4. University of California, S.F. - "Experimental Project in Expanded Duties for Advanced Students of Dental Hygiene"
5. Los Angeles City College & Cerritos College - "Infiltration Anesthesia for the Dental Hygienist Project"
6. Cabrillo College - "Local Anesthesia for the Dental Hygienist Project"

7. Sacramento City College - "Dental Hygienist Anesthesia Project"

Recent correspondence and conversations with the Dental Hygiene Association have indicated that many of their members are underutilized and seeking to fill additional available time. As of February 25, 1976, the Orange County component of the Southern California Dental Hygienists Association (SCDHA) reported that of 300 members, 121 were currently looking for work or additional work and that they had received inquiries about persons seeking jobs from only two dentists. At one point in the last six months, 8 of the hygiene association's members were on welfare.(17) Cypress College in Orange County is currently planning to open a program to train dental hygienists in September of 1976. They generally base their plans on 1969-70 surveys. Cypress College is located approximately 8 miles from Cerritos Junior College which already has a functioning dental hygienist program. In San Diego, of the 400 members of the SCDHA, 200 are actively seeking work or additional work. A program for training dental hygienists is currently being planned at San Diego City College.(17)

In Northern California at a November meeting of the Board of the Northern California Dental Hygienists Association, it was reported that there were hygienists seeking 450 days per month of employment, but only 52 day per month of hygienists' services sought by dentists.(17)

According to the State Department of Education, there were 13 training programs for dental hygienists in 1973. (See Table VI-25)

TABLE VI-25

CALIFORNIA SCHOOLS OFFERING PROGRAMS IN DENTAL HYGIENE

SCHOOL	CITY
Cabrillo College	Aptos
Cerritos College	Norwalk
Chabot College	Hayward
Chaffey College	Alta Loma
Foothill College	Los Altos
Fresno City College	Fresno
Loma Linda University	Loma Linda
Los Angeles City College	Los Angeles
Pacific Union College	Angwin
Pasadena City College	Pasadena
Sacramento City College	Sacramento
University of California Medical Center	San Francisco
University of Southern California	Los Angeles

Source: the California State Department of Education - 1973, Courses Offered by California Schools.

Dental Assistants, in contrast to most occupations discussed in this report, have comparatively few formally-trained personnel in the work force. In 1970, the number of formally-trained was only 9,200 in the U.S.; or less than 10% of the overall active supply (112,000). The number of formally-trained dental assistants is projected to reach 71,530 by 1990. The division of Dental Health (BHRD) has projected the overall supply of active dental assistants to reach 170,800 by 1990. These two projections suggest that the proportion of formally-trained assistants will rise substantially over the next fifteen years. Such an occurrence is indeed possible, since dental assistants, who historically have been largely trained on the job, are now evidencing a marked trend toward formal training. Illustrative of this recent trend is the growth of dental assistants programs in the past decade. The number of students in dental assistant programs has risen from about 1,000 in 1962 to over 5,000 in 1970, and over 7,000 in 1972.

In California, over forty formal training sites for dental assistants were identified by the State Department of Education in 1973. (See Table VI-26)

Thus, it is imperative to review very carefully any proposals for increased programs for auxiliaries with an eye towards the jobs available in marketplace for both dental assistants and hygienists.

TABLE VI-28

CALIFORNIA SCHOOLS OFFERING PROGRAMS IN DENTAL ASSISTING

SCHOOL	CITY
Adult Training School	Palmdale
Allan Hancock College	Santa Maria
Andon Medical-Dental-Nursing College	San Jose
Athena School	Long Beach
Bakersfield College	Bakersfield
Bay City College of Dental-Medical Assistants	San Francisco
Blair College	Costa Mesa
Blair College of Medical & Dental Assistants	Glendale
Blair College of Medical & Dental Assistants	Lawndale
Blair College of Medical & Dental Assistants	Long Beach
Blair College of Medical & Dental Assistants	Downey
Bryman School	Alhambra
Bryman School	Anaheim
Bryman School	Long Beach
Bryman School	Los Angeles
Bryman School	Sacramento
Bryman School	San Francisco
Bryman School	San Jose
Bryman Schools	Santa Monica
Bryman School	Torrance
Business Institute of Orange County	Santa Ana
Cabrillo College	Aptos
California College of Commerce	Long Beach
California College of Dental Training	Los Angeles
Career Academy	San Francisco
Casa Loma College	Pacoima
Central City Occupational Center	Los Angeles
Cerritos College	Norwalk
Chabot College	Hayward
Chaffey College	Alta Loma
Citrus College	Azusa
City College of S. F.	San Francisco
College of Alameda	Alameda
College of California Medical Affiliates	San Francisco
College of Marin	Kentfield
College of San Mateo	San Mateo
Contra Costa College	San Pablo
Foothill College	Los Altos
Fresno Technical College	Fresno
Fullerton Junior College	Fullerton
Galen College of Medical & Dental Assistants	Fresno
Grossmont College	El Cajon
Lawton School	Beverly Hills
Lawton School	Palo Alto
Lawton School	Encino
Lawton School	Santa Ana
Loma Linda University	Loma Linda
Long Beach City College	Long Beach
Long Beach Valley College of Medical-Dental Assistants	Long Beach
Los Angeles City College	Los Angeles
Merced Adult School	Merced
Merced College	Merced
Mid-State Business College	Modesto
Modesto Junior College	Modesto
Monterey Peninsula College	Monterey
Orange Coast College	Costa Mesa
Pacific College of Medical & Dental Assistants	San Diego
Pacific Union College	Angwin
Palomar College	San Marcos
Pasadena City College	Pasadena

TABLE VI-26-continued

CALIFORNIA SCHOOLS OFFERING PROGRAMS IN DENTAL ASSISTING

SCHOOL	CITY
Reedley College	Reedley
Rio Hondo College	Whittier
Sacramento City College	Sacramento
Sacramento College of Dental-Medical Assistants	Sacramento
San Bernardino College of Medical & Dental Assts.	San Bernardino
San Diego College for Medical & Dental Assts.	San Diego
San Diego Evening College	San Diego
San Diego Mesa College	San Diego
San Jose City college	San Jose
San Jose College of Dental-Medical Assistants	San Jose
Santa Barbara City College	Santa Barbara
Santa Rosa Junior College	Santa Rosa
Southern Cal. College of Medical & Dental Assts.	Anaheim
Southland College of Medical & Dental Assts.	Downey
Southland College of Medical & Dental Assts.	Montebello
Stanford Medical Center	Palo Alto
Ventura College	Ventura
Western College of Medical & Dental Assts.	Van Nuys

Source: California State Depratment of Education - 1973, Courses Offered by California Schools.

5. CLINICAL TRAINING SITES

The Department of Health, Education, and Welfare for the purpose of allocating National Health Service Corps personnel, has determined that there are only three areas in California underserved by their standards. Two out of the three are in remote locations on Indian reservations.

Various incentive mechanisms are investigated to bring individuals into the more remote locations to provide service. Review of the locations for dental schools and dental auxiliary training programs indicates a fairly broad distribution throughout the State. In addition, some of the dental schools, by using either mobile or fixed location clinics, take their students into the community, both rural and urban, where the individual dental student gets an opportunity to perceive practice conditions in these environments.(18)

In a $700,000 federal grant to a University of the Pacific project entitled "Teaching Dental Students Primary Medical Diagnosis for Referral in Emergency Services", dental students are trained in medical skills as an adjunct to dental skills in the remote areas where physicians are not available. Primary medical skills will be taught to the dental students by resident physicians from the Pacific Medical Center who will be on rotation at a clinic in Elk, a small community on the Pacific coast about 100 miles north of San Francisco with no resident physicians. So with the cooperative effort between the medical and dental programs and a newly established ambulance service, the approximate 3,000 residents of the area around Elk will have 24 hours and 365 days access to emergency medical and dental care.

Experimental programs like this should be encouraged. No additional sites, however, have been identified at this time for immediate development for new clinical training programs.

6. RECOMMENDATIONS

It is recommended that:

1. The state of California maintain on a continuing basis a health manpower intelligency system that is responsible for collecting, collating and analyzing data and information required to monitor dentist and dental auxiliary manpower and dental education trends systematically. It is recommended that this be a joint effort between the California Postsecondary Education Commission, the Senate and Assembly Research Offices, the Health Manpower Unit of the State Department of Health, the regional health system agencies in the State and the Department of Consumer Affairs.
2. There should be incentive programs to encourage the dental profession to utilize dental auxiliaries to implement preventive dental care programs in the schools and determine if they are a cost-effective means of dealing with dental disease.
3. Support should be given to demonstration projects to try out and evaluate the degree of increased productivity by utilizing expanded duty auxiliaries in private office settings.
4. Encouragement should be given to the development of educational outreach programs for dentists throughout the State. Emphasis should be given to emergency primary medical care diagnosis training for dentists in underserved areas as provided by the University of Pacific Dental Project in Elk.
5. The entering class enrollment for dental students in University of California schools should be limited to an increase of no more than 20 projected for U.C.S.F.'s program. In 1975, the total

enrollment of the entering class for the two University of California dental schools was 194. Based upon the rate of increase of the projected California population at 6.8% for the 1975-80 period, the recommended entering class for the two schools would only be 208 for 1980. The additional small expansion may be justified for an increase of educational opportunities.

It is projected, however, that the total number of licensed dentists will increase from 12,529 to 14,433 from 1975 to 1980. The ratio of dentists per 100,000 population will therefore increase from 59 to 63 per 100,000.

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VII. PHARMACY

1. INTRODUCTION AND SUMMARY

California has three of the seventy-two schools of pharmacy in the United States; the University of California at San Francisco (UCSF), the University of the Pacific (UOP), and the University of Southern California (USC). These three schools awarded 417 pharmacy degrees (or 5.8% of the national total) in the academic year 1974-75. Between 1966 and 1970, there was an increase of about 87% in the pharmacy degrees awarded by these three California schools. By the academic year 1976-77, the three schools should be graduating a combined total of about 450 pharmacy students.

In a 1973 analysis of active California pharmacists, it was established that approximately 54% had been trained in other than California schools. In addition, the enrollment in the three California schools of pharmacy is predominately California residents (the 1975-76 entering class was only 7% out of state or out of country). The same 1973 study showed that the average age of California pharmacists was quite young, that is 41 years of age; and the average work week was 45 hours. Generally, these data suggest a favorable supply of pharmacists in the near future.

It is difficult to project future demand for pharmacist services in the United States or California. There is no general consensus as to what reasonable pharmacist-per-population ratio should be sought. At the present time, distribution of pharmacists in California is quite good, with only one rural county not having at least one resident licensed pharmacist in 1975. This distribution of pharmacy practice is apparently a function of consumer demand, since about 75% of the California pharmacists are working in a community-based (independent or chain) pharmacy setting. If, however, a national health insurance program is instituted the increase in prescription drug consumption is estimated at 6 to 26% and this could significantly impact upon pharmacist manpower needs.

There are several major issues which relate to projecting future pharmacy manpower and recommended educational enrollments for California. These are briefly outlined below:

a. Uncertainty regarding whether pharmacists are underutilized. Eighty-five percent of the pharmacists in California reported spending some time in dispensing prescriptions and 69% spend over half of their time in this function. This issue relates to whether the highly educated professional pharmacist might not be more effectively and efficiently used in more extended roles, particularly clinically oriented ones. There appears to be insufficient information regarding the impact of using the pharmacist in an extended role upon the efficacy of the pharmacy and overall health care delivery systems.

b. Insufficient information with respect to the desirability and appropriateness of training pharmacy technicians to perform specified reallocated tasks of pharmacists in the preparation and distribution of medications under the supervision of pharmacists. At the present time, there is only one experimental project in California(11) which relates to training of pharmacy technicians located at the USC County Medical Center.

c. Uncertainty regarding the future of clinical pharmacy in the pharmacy profession. The Report of the Study Commission on Pharmacy, 1975(3) which was commissioned by the American Association of Colleges of Pharmacy, indicated that the future role of clinical pharmacists in various health settings is unclear, and even admitted that no consensus presently exists for the definition of this professional specialist. A rapid shift to the training of clinical pharmacists who serve essentially in new roles might create pharmacy position openings in traditional dispensing roles. Unless of course, certain traditional pharmacist responsibilities were shifted to technicians. It would seem appropriate for the California schools, with their large Doctor of Pharmacy programs, to provide research and experimentation leading to clarification of the clinical pharmacist's role.

Also, if comprehensive health services continue to become more organized and institutionalized in the U.S., and there is a growing acceptance and demand for clinical pharmacists, California may experience an overall decrease in pharmacist supply. This decrease in pharmacist supply might occur as a result of California's presently training the largest proportion of the clinically oriented Doctor of Pharmacy students.

The major recommendations regarding pharmacy education for consideration by the Postsecondary Education commission are:

a. the development of experimental health manpower training and retraining projects for extended role pharmacists and technicians in a variety of community and educational settings,

b. ongoing analyses of the impact of increased prescription drug consumption as a result of National Health Insurance on pharmacy manpower needs and incorporation of these analyses into the design for the experimental education projects in "a" above, and

c. no additional enrollments in the state-supported UCSF programs until definitive results are available from "a" and "b" above to develop definitive pharmacy education priorities for California.

TABLE VII-1

U.S. SUPPLY OF ACTIVE PHARMACISTS AND PHARMACIST/POPULATION RATIOS

Actual 1970; Projected 1975-1990

	1970		1975		1980		1985		1990	
	number	rate*	number	rate*	number	rate*	number	rate*	number	rate*
Basic methodology[1]	129,300	63.4	133,800	62.3	146,100	64.4	161,800	67.6	179,900	71.8
Low alternative[2]	129,300	63.4	133,800	62.3	145,600	64.2	158,700	66.3	171,800	68.5
High alternative[3]	129,300	63.4	133,800	62.3	146,900	64.7	167,100	69.8	194,200	77.5

*rate per 100,000 population; based on U.S. Census Report and Projections, resident population:

1970 - 203,805,000
1975 - 214,883,000
1980 - 226,934,000
1985 - 239,329,000
1990 - 250,630,000

Three methodologies were used to account for the impact of future funding on first year pharmacy school enrollment:

1 - assumes a moderate increase in enrollment
2 - assumes a stable enrollment remaining at the 1974-75 level
3 - assumes a higher increase, slightly more than 2½ times that of the basic methodology

Notes: Figures include all active pharmacists in the 50 States, the District of Columbia, Puerto Rico, and the Virgin Islands.

Projections include all pharmacists active on 1/1/71 plus the estimated number of graduates for the twenty-year period minus the estimated number of pharmacists lost due to retirement and death.

Source: The Supply of Health Manpower, 1970 Profiles and Projections to 1990, U.S. Department of Health, Education and Welfare, December 1974, cahpter 7.

2. SUPPLY TRENDS AND PROJECTIONS

Licensure Data. In 1970, there were approximately 129,300 pharmacists in practice in the United States. Over the past forty years the number of active pharmacists has increased by about 45,000 or about 50%. However, the ratio of active pharmacists to population decreased during this period from 68/100,000 in 1930 to 62/100,000 in 1971. Currently, it is estimated that there are 133,800 active pharmacists (or a ratio of about 62.3/100,000) in the country. This supply is projected to increase to 146,100 in 1980 (producing an estimated ratio of between 64.2 and 64.7 per 100,000) and 179,900 in 1990 (producing an estimated ratio of between 68.5 and 77.5 per 100,000).(6) (Table VII-1)

In 1970 the pharmacist to population ratio in California was reported to be 60.9 (as opposed to the national average ratio of 61.0). California ranked 28th nationally in the pharmacist to population ratio.(17)

By January 1972, the National Association of Boards of Pharmacy/National Center for Health Statistics reported the ratio to be 62.7 in California.(15) It was recently estimated that the ratio has now increased to over 63.0.(13)

TABLE VII-2

LICENSED PHARMACISTS IN CALIFORNIA BY COUNTY

TYPE - PHARMACIST 12/30/75

1	Alameda	557	31	Placer	52
2	Alpine		32	Plumas	15
3	Amador	9	33	Riverside	245
4	Butte	70	34	Sacramento	424
5	Calaveras	12	35	San Benito	12
6	Colusa	11	36	San Bernadino	278
7	Contra Costa	391	37	San Diego	681
8	Del Norte	6	38	San Francisco	613
9	El Dorado	35	39	San Joaquin	255
10	Fresno	285	40	San Luis Obispo	81
11	Glenn	10	41	San Mateo	399
12	Humboldt	54	42	Santa Barbara	163
13	Imperial	28	43	Santa Clara	625
14	Inyo	12	44	Santa Cruz	104
15	Kern	175	45	Shasta	49
16	Kings	25	46	Sierra	3
17	Lake	15	47	Siskiyou	25
18	Lassen	9	48	Solano	62
19	Los Angeles	3,758	49	Sonoma	159
20	Madera	27	50	Stanislaus	141
21	Marin	185	51	Sutter	25
22	Mariposa	2	52	Tehaha	10
23	Mendocino	27	53	Trinity	5
24	Merced	47	54	Tulare	112
25	Modoc	5	55	Tuolumne	17
26	Mono	2	56	Ventura	205
27	Monterey	120	57	Yolo	45
28	Napa	51	58	Yuba	19
29	Nevada	21	59	Out of State	1,836
30	Orange	1,088	60	Out of Country	54
				Prefix Count	13,751

Source: Board of Pharmacy.

The California Board of Pharmacy reported as of December 30, 1975[(4)] that there were 13,751 licensed pharmacists in California, of which 1,836 were out of state and 54 were out of country (leaving a total of 11,861). A study of California pharmacists in 1973 showed that approximately 87% of the licensed pharmacists living in the State were professionally active.[(12)] Therefore, we can estimate that presently there are about 10,320 active pharmacists in California.

The distribution of pharmacy licensees in California appears to be reasonable, with only one rural county not having at least one resident pharmacist as of 1975.[(4)] In 1973 there were 329 pharmacists in active practice in 18 rural California counties. Unlike certain other health professions, the location of practice is apparently a function of consumer preference and demand rather than provider convenience.[(13)]

Migration. A significant percentage of California's pharmacists are trained out of state. Table VII-3 shows that in 1973 approximately 48% of the active pharmacists in California completed their professional education (first pharmacy degree) in out-of-state institutions.

TABLE VII-3

NUMBER OF ACTIVE RESIDENT PHARMACISTS

BY SCHOOL GRANTING FIRST DEGREE - CALIFORNIA, 1973[(12)]

Pharmacy School	Active, Resident Pharmacists	Percent
University of So. Calif.	2343	45.6
University of Calif.-S.F.	2052	
University of the Pacific	791	
University of Arizona	416	48.4
Oregon State University	379	
Idaho State University	369	
University of Utah	297	
University of Colorado	216	
Other	3819	
Not reported	681	6.0
TOTAL	11363	100.0

TABLE VII-4

DEGREES CONFERRED BY CALIFORNIA SCHOOLS AND COLLEGES OF PHARMACY 1966-1975 AND PROJECTED FOR 1976 and 1977

School	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	Totals 1966-75	Projected 1976	Projected 1977
U.C.S.F.													
B.S.	—	—	—	—	—	—	—	—	—	—	—	—	—
Pharm. D.	80	62	79	71	81	86	83	78	84	84	788	93	97
M.S.	1	4	4	2	1	1			1		14		
Ph.D.	10		9	6	6	5	6	9	14	7	72		
Total	91	66	92	79	88	92	69	87	99	91	874	93	97
U. O. P.													
B.S.	42	59	62	56	78	71	60	127	62	45	662	42	na
Pharm. D.	3	3	2	1	22	30	36	91	130	152	470	162	na
M.S.	—	—	—	—	—	—	—	—	—	—	—	—	—
Ph.D.	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	45	62	64	57	100	101	96	218	192	197	1132	205	na
U.S.C.													
B.S.	—	—	—	—	—	—	—	—	—	—	—	—	—
Pharm. D.	99	93	122	82	96	114	99	113	131	121	1070	125	144
M.S.	—	—	2	—	—	11	9	10	—	11	43	12	11
Ph.D.	—	—	1	—	3	—	—	—	—	—	4	4	2
Total	99	93	125	82	99	125	108	123	131	132	1117	141	157
Totals	235	221	281	218	287	318	293	428	422	420	3123	439	

Compiled from data submitted to the California Health Manpower Study Office by the individual schools, Spring '76.

Enrollment Data. According to the American Association of Colleges of Pharmacy, there are approximately 72 schools of pharmacy in the continental United States. These schools awarded 6,246 baccalaureate degrees in the 1974-75 academic year (an increase of 752 or 13.7% over the 1973-74 total). In addition, 339 masters degrees (a one-year increase of 5.9%) and 189 Ph.D. degrees (an increase of 4 degrees in one year) were awarded in 1974-75. A total of 313 Doctor of Pharmacy degrees were awarded nationally (an increase of 19 degrees from the previous year).(2)

The three California schools of pharmacy, the University of California at San Francisco (UCSF), the University of the Pacific (UOP), and the University of Southern California (USC), produced a total of 417 pharmacy degrees in 1974-75 (of which 38 were graduate degrees to students previously awarded the baccalaureate in pharmacy degree). The 417 California degrees represent 5.8% of the total pharmacy degrees awarded in the U.S. in 1974-75. The three California schools awarded only 47 baccalaureate degrees (less than 1% of the national total), 13 M.S. degrees (3.8% of the national total), and 7 Ph.D. degrees (3.7% of the national total). As in previous years the three California schools awarded the vast majority of the more clinically-oriented Doctor of Pharmacy degrees (a total of 311 or 99.3% of the national total).(2)

As noted in Table VII-4,the figures received from the individaul California schools do not match exactly those of the National Association. However, the percentages remain the same except for the Doctor of Pharmacy degree, which shows a total of 357 degrees conferred. This is more than the total national figure supplied by the National Association, but whichever figures are used, the California schools still produce the largest percentage of Doctor of Pharmacy degrees.

In 1969-70, 799 students were enrolled in the last three years of the professional program in California's three schools of pharmacy. By 1974-75, that number had increased to 1,234, an increase of approximately 55%.(3) (Table VII-5). Pharmacy degrees conferred over a ten year period by UCSF, UOP, and USC may be seen in Table VII-6. During this period of time the number of degrees awarded increased approximately 87%, with the largest program expansion taking place at the private UOP. By the academic year 1976-77, the three schools should be graduating a combined total in excess of 450 pharmacy degrees.

It is obvious from this table that UCSF and USC have traditionally emphasized the clinically oriented Doctor of Pharmacy program, and by 1970, UOP followed a similar academic pattern. This is significant that California produces nearly all of the pharmacists who are best trained to work as a member of a clinical health team in a variety of health care settings. If in the near future, pharmacists are more widely utilized by physicians, nurses, etc., a goodly number of California's Doctor of Pharmacy graduates may move to other areas of the country due to increased demand for their clinical expertise.

TABLE VII-5
ENROLLMENT AND GRADUATES OF THE THREE CALIFORNIA PHARMACY SCHOOLS
AACP ENROLLMENT REPORTS, 1970, 75, & 77

	1970	1975	1977
Enrollment for Last Three Years of Professional Program	799	1234	-
% Increase	-	+55%	-
Graduates	294	376	452
% Increase	-	+28%	+50%

Source: American Association of Colleges of Pharmacy.

Supply and In-migration Projections. The methodology for projecting the future supply of pharmacists in California is described in Appendix D, together with a base case projection in which observed past patterns and trends are assumed to continue into future years. In this projection methodology, estimates are made of expected losses or attrition in the existing (1975) supply of pharmacists, as are expected gains or additions from new California graduates and new in-migrations. A summary of the base case projection is shown in Table VII-6.

Table VII-6 Base Case Projection of California Pharmacists (28)

	1975	1980	1985	1990
Total Licensed	11,801	13,769	16,195	18,961
Total Active	10,319	11,979	14,090	16,496
From 1975 Supply		8,926	7,757	6,641
Immigration		1,197	2,499	3,926
New Graduates		1,856	3,834	5,929
Pharmacists per 100,000	48	52	59	63

a. Educational Output

In this base case projection, it was assumed that the future rate of growth in California pharmacy education programs would be equal to the rate of growth for the United States, as estimated in reference 27. The annual rate of growth is as follows: .018 for the 1976-80 period, .015 for the 1981-85 period, and .015 for the 1986-90 period. Although lower than recent California experience, which averages about three percent (compounded) for the 1971-75 period, these rates of growth were chosen to provide a basis of comparison with the results for the United States, as shown in Table VII-7 on the next page.

Table VII-7 Comparison of United States and California Past and Base Case Projected Future Supply of Active Pharmacists (28)

	United States*		California	
	Active Pharmacists	Pharmacists per 100,000	Active Pharmacists	Pharmacists per 100,000
1969	124,486	-	11,600*	59
1973	132,899	-	12,500*	60
1975	133,800	62	10,300**	48
1980	146,100	64	12,000	52
1985	161,800	68	14,000	57
1990	179,900	72	16,500	63

* Source: DHEW, *The Supply of Health Manpower*, December 1974.
** California Board of Pharmacy

These results indicate that the assumptions for the base case projection described in Appendix D may not be fully compatible with the methodology and assumptions used in the national projections, as indicated by the fact that the rate of growth between 1976 and 1990 in the number of active pharmacists for California (4.0% per year) is significantly greater than that for the U.S. as a whole (2.3). The source of this difference is not entirely clear from the limited methodological information published in reference 27. However, since the rate of growth in graduate output is identical for both the California and the U.S. projections, the source of this difference must lie in either the age-specific rates of attrition used in the California model or the migration rates assumed.

In addition, there is a major difference between the California and the U.S. ratios of pharmacists per 100,000, as shown in Table VII-7. The source of this difference is the fact that the 1975 number of licensed pharmacists reported by the State Board of Pharmacy is, for some reason, 18% less than that reported by the National Boards of Pharmacy in 1973. Thus, the large difference in the ratios is due to a difference in data sources, and these differences should not be taken as an indication that California has a significantly lower ratio than the national average.

The actual rates of growth in future educational output of trained pharmacists in the state of California is, in fact, likely to depart from the national average and will be determined in part by State policy. However, as stated above, the methodology employed for projecting future supply can be used to examine the impacts of alternative assumptions. A complete description of the sensitivity analyses performed on the impacts of various assumptions is contained in Appendix D. A summary of the results of the impacts of changes in educational output considered in this appendix is shown in Table VII-8.

TABLE VII-8

Sensitivity of Future Pharmacists Supply to Future California Educational Output (28)

	Change in Growth Rate	1985 California Graduates		Active Pharmacists per 100,000	
		Number	Change	Number	Change
Base Case		483		57	
Alternative #1	+2.5%	622	+29%	59	+.035%
Alternative #2	+5.0%	790	+64%	62	+.088%
Alternative #3	+10.0%	1,259	+1.61%	67	+.176%

These results show, as would be expected, that the future California supply of pharmacists is quite sensitive to the rate of growth in educational output. Each percentage of increase in the growth rate relative to the base case rate produces about a 1.8% increase in the number of pharmacists per 100,000.

Table VII-8 also illustrates the significant implications for educational output requirements of changes in the target ratio of pharmacists per 100,000. The 3.5% increase in the ratio implies almost a 30% increase in the level of graduate output. Thus, each percentage change in the 1985 ratio corresponds to about an eight percent change in output.

b. Migration

From past trends it was assumed in the base case projection that the in-migration rate of pharmacists trained outside the state would be equal to 0.2% of the total number trained in the United States each year and that the retention rate for California graduates was 1.0. As with the assumption on the rate of growth of graduate output, the methodology can also be used to examine the impacts of changes in migration patterns.

Consider, first, the in-migration rate. Table VII-9 shows the impact of changes in the rate of inflow.

TABLE VII-9

Sensitivity of Future California Pharmacist Supply to Future In-Migration (28)

	In-Migration		1985 Active Pharmacists per 100,000	
	Rate	Change	Number	Change
Base Case	.0020		57	
Alternative #1	.0018	(-)10%	56	(-)1.5%
Alternative #2	.0015	(-)25%	55	(-)4.0%
Alternative #3	.0010	(-)50%	52	(-)9.0%

These results indicate that future supply is relatively insensitive to changes in the assumed rate of in-migration. Each one percent change in the in-migration rate produces about .15% change in the pharmacist per 100,000 population ratio. Thus, a full 50% decrease in the in-migration rate produces less than 10% change in the ratio of pharmacists per 100,000.

Table VII-10 shows the impact of changes in the retention rate of California graduates on future supply. As can be seen from Table VII-10, the pharmacists per 100,000 ratio is also somewhat insensitive to the assumed rate of retention (or, conversely, the rate of out-migration). Each 1% decrease in the retention rate results in a .2% reduction in the 1985 pharmacist to population ratio.

TABLE VII-10

Sensitivity of Future California Pharmacist Supply to the Retention of California Graduates (28)

	California Graduate Retention		1985 Active Pharmacists per 100,000	
	Rate	Change	Number	Change
Base Case	1.00		57	
Alternative #1	.95	(-) 5.0%	57	(-)0.0%
Alternative #2	.90	(-)10.0%	56	(-)2.0%

TABLE VII-11

FIRST YEAR (ENTERING CLASS) OF STUDENTS IN CALIFORNIA SCHOOLS OF PHARMACY BY SCHOOL AND LEGAL RESIDENCE

1975

School	California		Other States		Foreign		Total	
	#	%	#	%	#	%	#	%
U.C. System								
UCSF	107	98.2	1	<1.0	1	<1.0	109	100
Private								
USC	151	93.2	10	6.2	1	<1.0	162	100
UOP	180	87.8	16	7.8	9	4.4	205	100
Totals	438	92.0	27	5.7	11	2.3	476	100

Compiled from data sent to the California Health Manpower Study Office by the individual schools, Spring 1976.

Educational Opportunity

As previously mentioned in this report, there are three schools of pharmacy in California, UCSF, USC, and UOP. The Office of Health Planning at the University of California estimated in 1960 that 75% of the California residents enrolled as pharmacy students were in California schools. This figure was reduced to 68.6% by 1968. No more current analyses of this nature are available; however, California presently ranks 39th nationally in pharmacy student/population ratios (number of California students enrolled as pharmacy students/California population).(20)

The American Association of Colleges of Pharmacy study of the geographical distribution of undergraduate pharmacy students for the academic year 1974-75 provides an interesting analysis of which schools California's pharmacy students are enrolled in. In 1974-75, there were a total of 1,153 California resident students enrolled in UCSF, UOP, and USC. That figure represented 94% of the total California students enrolled in pharmacy schools in the country. The other 6% (278 California students) were enrolled in pharmacy schools in other states.(19)

Tumelty's analysis of the 1975-76 entering classes of the three California schools of pharmacy showed that only 8% of the students are from out of state or country (38 out of a total of 476). UCSF has only 2 non-California residents in its entering class, while USC has 11 and UOP 25.(23) (Table VII-11)

TABLE VII-12

FIRST YEAR (ENTERING CLASS) OF STUDENTS IN CALIFORNIA SCHOOLS OF PHARMACY BY SEX AND ETHNIC ORIGIN, 1975

School	Ethnic Origin					Total	Sex	
	Asian American	Black	Caucasian	Chicano	Other*		M	W
UCSF	30	8	61	9	1	109	55	54
UOP	49	3	123	9	21	205	141	64
USC	26	9	91	9	24	159	99	60
Totals	105	20	275	27	46	473	295	178

*includes Native Americans.

Compiled from date submitted to the California health Manpower Study Office by the individual schools, Spring 1976.

With respect to minority representation, the 1975-76 entering classes at California's three schools of pharmacy are 58.1% Caucasian, 22.2% Asian American, 5.7% Chicano, 4.2% Black and 9.8% Other (including Native Americans). Based upon this one year analysis it would appear that by way of comparison with the ethnic composition of the California population, the Asian Americans are overrepresented and Blacks, Caucasians, and Chicanos are underrepresented.(23) (see Table VII-12)

The table also shows 62.4% male and 37.6% female pharmacy students in in the same entering classes at the California pharmacy schools.

Nationally, in 1973-74, pharmacy graduates were 2.8% Asian American, 2.7% Spanish Surnamed, and only 8 Native Americans. Nationally, the same graduating class was 27% female and 73% male.(2)

TABLE VII- 13

NUMBER OF ACTIVE RESIDENT PHARMACISTS BY RACIAL-ETHNIC BACKGROUND AND SEX: CALIFORNIA, 1973

Racial-Ethnic Background	Total[1]	Sex	
		Male	Female
Total	11363	9944	1383
White	9318	8366	950
Black	211	161	50
Japanese/Chinese	1372	1079	293
Other Asian	72	37	35
American Indian/Eskimo/Aleut	15	13	2
Mexican American	135	121	14
Puerto Rican	7	3	4
Other Latin American	55	39	16
All other	70	59	11
Not reported	108	66	8

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[1] Includes pharmacists who did not report sex.

Source: *Registered Pharmacists in California, 1973*; U.S. Department of Health, Education and Welfare.

A 1973 study of active pharmacists in California reported approximately 88% male and 12% female pharmacists. The same study showed 82.0% Caucasian, 1.9% Black, 12.7% Asian American, 1.7% Spanish Surnamed, and less than 1% Other (including Native Americans).(12) (Table VII-13)

Thus, even though the percentage of minorities in the entering classes is satisfactory, this ratio is not yet reflected by the active pharmacists in the State.

TABLE VII-14

NUMBER OF ACTIVE RESIDENT PHARMACISTS BY PRINCIPAL PLACE OF PRACTICE AND HOURS WORKED PER WEEK: CALIFORNIA, 1973

Principal place of pharmacy practice	Total[1]	Hours worked per week							
		Less than 10	10-19	20-29	30-39	40-49	50-59	60-69	70+
Total.	11363	189	307	441	493	6006	1855	791	274
Community pharmacist independent	4634	117	185	237	271	1882	1121	556	211
Community pharmacist chain	3121	31	56	93	116	2257	415	104	32
Hospitals and nursing homes	1279	26	37	81	69	909	110	30	13
Manufacturing	287	1	6	2	3	158	80	30	2
Government, Teaching, & other Pharmaceutical Capacities	1016	11	14	26	26	742	115	64	12
Not reported	1026	3	9	2	8	58	14	7	7

[1] Includes those pharmacists who did not report hours worked per week.

Source: Registered Pharmacists in California, 1973; U.S. Department of Health, Education and Welfare.

3. DEMAND AND PROJECTIONS

There is not much useful data available regarding the deamnd for pharmacy services. A 1973 study of California pharmacists showed that about 4.4% of the personnel worked less than 20 hours per week; however, about 25% worked from 50 to 69 hours per week. The average work week of pharmacists was 45 hours. Therefore, overall, the productivity of California's active pharmacists appears quite good (insofar as more than two-thirds of California's pharmacists are functioning as community pharmacists, either as independents or as chain store employees).(12) (See Table VII-14.)

The California Employment Development Department estimates that between 1975 and 1980 market demand and attrition (replacement) factors will account for 3,021 pharmacist position openings (an average of 604 per year).(9) (See Appendix E, Page E-1).

The UCSF School of Pharmacy recently estimated the deficit in numbers of graduates which would occur nationally by 1985 if we established the goal of maintaining the present ratio of about 63 pharmacists per 100,000 (a deficit of 943 graduates).(20) If we established a ratio goal of 88 pharmacists per 100,000 for 1985, the graduate deficit would increase to 11,443.

It should be noted that anticipated changes in the pharmacy delivery system may alter the traditional ratio approach to assessing future pharmacy manpower requirements. Hopefully more effective and economical systems of drug delivery will be developed. Computer systems may sort, store and retrieve information needed for dispensing, reordering, and billing third-party prescriptions. Pharmacists may be assisted by technicians who can perform a variety of routine dispensing tasks. If pharmacists are to be significantly involved as a member of the clinical health team, different kinds and numbers of pharmacists may be required.(13)

TABLE VII-15

NUMBER OF ACTIVE RESIDENT PHARMACISTS BY HOURS WORKED PER WEEK, SEX AND AGE: CALIFORNIA, 1973

Hours worked per week	All active resident pharmacists[1]	Males by age group				Females by age group			
		Total[2]	Less than 30	30-49	50 and over	Total[2]	Less than 30	30-49	50 and over
Total. . . .	11363	9944	1315	5334	3181	1383	375	743	250
Less than 10.	189	134	6	12	116	55	7	36	10
10 - 19	307	191	11	30	146	115	15	79	18
20 - 29	441	272	26	45	192	169	43	91	34
30 - 39	493	371	49	95	224	122	40	66	15
40 - 49	6006	5390	962	3024	1358	615	225	301	84
50 - 59	1855	1802	174	1176	440	52	13	31	8
60 - 69	791	770	42	549	177	21	6	11	4
70 and over	274	263	14	171	76	11	2	4	5
Not reported.	1007	751	31	232	452	223	24	124	72

[1] Includes pharmacists who did not report year of birth or sex.

[2] Includes pharmacists who did not report year of birth.

Source: Registered Pharmacists in California, 1973; U.S. Department of Health, Education and Welfare.

It should be noted that the average age of active pharmacists in California is 41 years.(12) Therefore, the largest proportion of state pharmacists will presumably continue to be productive for about 15 years.

Impact of National Health Insurance. It is difficult to project what the effect of various levels of National Health Insurance (NHI) might be upon the demand for pharmacist services nationally or in California. The change in demand will be a function of the level of the drug deductible provision of any NHI program and the changing system of health care delivery, and changing consumer attitudes which might occur as a result of NHI legislation incentives.

Most analyses of the impact of NHI suggest that the greatest increase in demand will be upon ambulatory, primary care services.(16 & 25) Any expansion of ambulatory services will undoubtedly result in increased use of prescription drugs, and the full impact of this will be primarily determined by the proportion of the ambulatory service costs reimbursed under the NHI program. A review of the literature provided no definitive information regarding the specific impact of NHI upon pharmaceutical manpower needs.

In a study conducted for the U.S. Department of Commerce in 1975, an attempt was made to estimate the impact of NHI on the pharmaceutical industry.(24) It was concluded that no definitive estimate of the impact could be made; however, the possible upper boundaries of increased drug consumption could be somewhere in the neighborhood of 6% (Long-Ribicoff legislation), 17% (Comprehensive Health Insurance Plan), or 26% (Health Security Bill).

TABLE VII-16
NUMBER OF ACTIVE RESIDENT PHARMACISTS BY SELECTED WORK ACTIVITY AND PERCENT OF TIME DEVOTED TO SELECTED WORK ACTIVITY: CALIFORNIA, 1973

Selected work activity	All active resident pharmacists reporting activity	Percent of time devoted to selected work activities			
		1-15	16-50	51-85	86-100
Dispensing prescriptions	9659	757	2384	4995	1523
Sale & consultation of nonprescription drugs . .	8038	6507	1497	32	2
Consultation with patients on prescription drugs	8613	6902	1686	25	0
Sale & consultation on other health related items	5122	5001	114	4	3
Consultation w/nursing homes or small hospitals	2300	2044	232	21	3
Communicating w/other health professions on health related matters	7789	6528	1147	99	15
Manufacturing or bulk compounding.	2725	2568	113	22	22
Retailing nonhealth-related goods.	3728	3411	301	15	1
Teaching	1765	1562	162	26	15
Research in pharmaceuticals.	554	448	67	15	24
Detailing drugs to health professionals.	1280	1112	77	24	67
Administrative managerial.	3948	3660	1626	478	184
Other activities.	402	297	82	15	8

Note: A pharmacist may report time spent in more than one work activity.

Source: Registered Pharmacists in California, 1973; U.S. Department of Health, Education and Welfare.

4. TRENDS IN UTILIZATION PATTERNS

A 1973 study of active California Pharmacists showed that about 75% were functioning in a community independent or chain pharmacy setting.(12) The next largest group, about 17%, were working in a hospital or skilled nursing care facility. Others were distributed in government, teaching, industrial and other facilities. Eighty-five percent of the pharmacists in the State reported spending some time in the dispensing of prescriptions. Of those, 67% reported devoting more than one-half of their time to dispensing drugs. The next most commonly reported activities were consultation with patients on prescription drugs, sale and consultation of nonprescription drugs, and communicating with other health professionals regarding health related matters. The profile of California pharmacists is quite similar to that of settings and activities reported for pharmacists throughout the United States.(18) (Table VII-16)

In view of the fact that pharmacists are spending such a large proportion of their time dispensing, it raises the question whether or not adequately trained paraprofessionals could not safely perform some of these functions under the direct supervision of the pharmacist. Such an approach might free a portion of the pharmacist's time for functions that are more appropriate for his level of training (underutilization issue).

Several studies have suggested that a reduction in drug utilization and related expenditures can be achieved by more intensive use of pharmacist monitoring.(7, 8, & 12) It is assumed that such monitoring will increase quality of care by the identification of inappropriate concurrent prescribing and avoidance of adverse reactions. Recognition of the need for more careful pharmaceutical controls in institutional settings resulted in the federal requirement for pharmacist consultants to review drug regimens of patients in skilled nursing and intermediate facilities (PL 92-603), Social Security

Amendment Act of 1972). If this concept of pharmacist monitoring is extended to other Medicare and Medicaid patients (e.g. for those in an acute care hospital or receiving ambulatory services) there would be a quantum increase in the need for pharmaceutical manpower. In the Group Health Cooperative of Puget Sound, pharmacists provide health education sessions for patients on long term drug therapy regimens such as are required for diabetes, hypertension and coronary disease.(3) In another recent development, Blue Cross of Central Ohio approved payment for clinical pharmacists to conduct education programs for hemophiliacs and patients involved in self-administration of anti-cancer agents.(10)

There is not yet apparent agreement among pharmacy educators as to the precise definition and functions of a clinical pharmacist. On the one hand, it may include the individual community pharmacist who has expanded his practice to include development of patient drug profiles and consultation with prescribing physicians; at the other end of the clinical spectrum is the hospital pharmacist who participates in prescribing decisions, monitoring patient response to drug therapy, development of institutional drug policies, etc. It does seem apparent that the clinical pharmacy movement will continue to profoundly affect pharmacy education and practice.(3) A growing recognition is the potential value of having the pharmacist serve as a member of the primary care health team, communicating and interacting with providers and patients through a variety of preventive and therapeutic media.(21)

There does not appear to be a significant movement among pharmacy educators to address the issue of training of pharmacy technicians.(3) Apparently this is a very controversial issue among practicing pharmacists. As was the case with physician assistants and nurse practitioners, there is fear of encroachment by the paraprofessional into the professional's sphere of practice, problems related to inadequate supervision of such personnel, and concern regarding who will train those personnel. At the present time various kinds of pharmacy aides are being trained "in house" in hospitals, clinics, etc.

There are two projects in California experimenting with the training of pharmacists to administer medications in hospital settings.(11) One of the projects also trains pharmacy technicians for medication administration, and they perform some functions involving some reallocation of pharmacists' tasks. It would appear that more such experiments are needed to explore the feasibility of training, supervising, and utilizing parapharmacists personnel.

Increased support, if not demand, for pharmacy technicians undoubtedly will occur as more health services are delivered institutionally or in an organized fashion (e.g. prepaid group health plans).

6. CLINICAL TRAINING SITES

UCSF required inpatient and outpatient clerkships provide an opportunity for students to observe how pharmaceutical services are rendered by the clinical pharmacist in a variety of settings such as the University teaching hospital, outpatient clinics, extended care facilities and public health programs in the community.

The University has identified the need for a professional person who is primarily concerned with and skilled in drug therapy. Their concept of such a clinical pharmacist is one thoroughly versed in the basic science core, but with a broad perspective on drug therapy so that he can adapt to a wide variety of clinical settings. The emphasis is upon training the clinical pharmacist as a member of a team of other health practitioners. Initial clinical training was established in the hospital and clinics on the UCSF campus. A clerkship is presently being established at San Francisco General Hospital, and others have been established as far away as San Diego and Fresno.(14)

The USC School of Pharmacy has collaborated with the Central Region of the Los Angeles County Department of Health Services and the Sunol and Casa Moraville Centers in East Los Angeles to plan for comprehensive primary care to a predominantly Mexican-American population. The purpose is to provide an opportunity for clinical pharmacy students to gain experience in integrating pharmacy services into the primary health care team.(21) USC also has clinical pharmacy affiliations with Long Beach Memorial Hospital, St. Mary's Hospital (both in Long Beach), Cedars-Sinai Hospital, Midway Hospital (both in Los Angeles), Verdugo Hills Hospital (in Glendale), and Rancho Los Amigos Hospital (in Glendale). It has additional clinical affiliations with several Los Angeles outpatient clinics, and psychiatric hospitals throughout the State.(5) The

USC School of Pharmacy's interest in expanded roles for the pharmacist include plans for their active participation in patient care in hospitals, skilled nursing facilities, and ambulatory care facilities. Clinical responsibilities for the pharmacist will include such activities as monitoring the patient for adverse drug reactions and potential drug interactions, maintenance of a patient drug profile, and consultation with physicians, nurses, and other personnel.(23)

The UOP School of Pharmacy has affiliations with the following hospitals: Dominican Santa Cruz; San Joaquin General and St. Joseph's, Stockton; Letterman Army Medical Center, Presbyterian, and St. Joseph's, San Francisco; Naval Regional Medical Center and Veterans Administration Hospital, San Diego; El Cajon Valley Hospital, El Cajon; Tripler Army Medical Center, Honolulu; and Roseville Community Hospital in Roseville. These affiliations provide the clinical training for students in the clinical pharmacy emphasis. There is also a year of pharmacy internship for students who have completed their undergraduate training which is offered with the Veterans Administration Hospital.(26)

In addition, all pharmacy students (even those not in clinical pharmacy) are required to spend a semester in a pharmacy internship. The internship involves the cooperation of a preceptor-pharmacist, the State Board of Pharmacy and the School of Pharmacy. Preceptors are pharmacists located throughout the State who have agreed to meet the educational requirements for this work/study period as established by the State Board and the School. Students receive a salary which is commensurate with local practice in addition to a semester's credit.(26)

6. RECOMMENDATIONS

The following recommendations regarding pharmacy education are presented for consideration by the California Postsecondary Education Commission.

1. The State should encourage and provide financial incentives for the development of experimental health manpower projects designed to explore extended role pharmacy and most economical use of pharmacy manpower, including pharmacy technicians. These projects should be developed in accordance with the recommendations of the Advisory Commission on Pharmacy to the California State Assembly pursuant to HR-21(1) and the Second Annual Report to the Legislature on the California Experimental Health Manpower Pilot Project (AB1503).(11)

These experimental investigations should be conducted in a variety of settings, including community pharmacies, outpatient clinic centers, mental health facilities, acute care, intermediate and skilled nursing care facilities. The most appropriate role needs to be identified for the clinical pharmacist with respect to his potential function as a member of various health teams, interacting with the patient (including education) and other health personnel. Consideration needs to be given to not only the needed training of new pharmacists but to retraining in accordance with California's new Mandatory Continuing Education Act for Pharmacists which requires the completion of 30 hours of instruction biannually.

Studies relating to technician training should be directed toward appropriate delegation of pharmacist tasks with consideration of the following questions:

- What are the medical legal implications of such delegation?
- In what settings should these personnel be utilized and with what level of pharmacist supervision?

- Who should develop the training programs, accredit them and certify students?
- What additional quality controls should be built into the pharmacy delivery system which utilizes these technicians?
- What are the cost benefits (if any) to the pharmacy and overall health delivery systems?

2. The State should monitor the pattern of establishment of residential practice of Doctor of Pharmacy students who graduate from the three California schools during the next several years. Should a significant proportion of these students establish their practice out of state then California pharmacy school enrollments should be increased accordingly.

3. The State should conduct ongoing analyses of the projected impact of increased prescriptive drug consumption under NHI (6-26% increase) upon pharmacy manpower needs. These analyses should be coordinated with the experimental health manpower studies of extended role pharmacists and pharmacy technicians. In this manner, California can rationally plan for future pharmacy manpower needs with consideration of the most economical and qualitative approach to the problem.

4. No additional enrollments are recommended for the state-supported UCSF program beyond those already projected. UCSF intends to increase the entering professional class of 109 in 1975-76 to 120 in 1977-78. The graduate enrollment will increase gradually from 50 in 1973-74 to 65 by the end of the decade.(20)

This enrollment recommendation is predicated upon California's continuing to maintain its favorable inmigration of pharmacists and retention of our graduates from UCSF, UOP and USC (particularly the Doctor of Pharmacy students. See recommendation #3). Should this pattern change significantly the enrollments at UCSF should be increased proportionately.

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This recommendation is also based on the favorable distribution of pharmacists in California and the relatively young age of the practicing professional.

It is true that California awards only about 6% of the total pharmacy degrees in the continental United States,(2) even though the State encompasses 10% of the country's population. Additionally, California ranks 39th with respect to pharmacy student/population ratio.(20) However, currently only 80.8% of the pharmacy students nationally are enrolled in schools in their home state, whereas California educates 94% of its students within the State. The issue appears to be how the State can best utilize new resources which might be used for pharmacy education.

It appears at the present time that the State could best utilize new resources for pharmacy education to support experimental training and retraining projects for pharmacists and technicains in rational preparation for changes in the delivery system which will parallel the institution of NHI. California, with its strong Doctor of Pharmacy programs and AB 1503 enabling statutes should most appropriately provide this leadership in experimentation with the delivery and educational systems.

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OPTOMETRY

1. INTRODUCTION AND SUMMARY

California has two of the twelve schools of optometry in the United States: the Southern California College of Optometry (SCCO) and the University of California School of Optometry, Berkeley (UCB). It is projected that by 1977, 989 optometrists per year will be graduated, of which 144 will be products of the two California Optometry institutions. There has been almost a 100% increase in optometry graduates in California in the last 10 years.

California has a favorable immigration of optometrists, averaging somewhere between 15 and 22 per year. Also the two schools of optometry in the state take in about 14% of the entering students in the country. UCB admits predominantly California students whereas SCCO is expected to gradually increase the proportion of out-of-state students in the next several years. Historically, according to the best information available, the graduates of the California schools of optometry tend to stay and practice in the State. The favorable immigration factor is somewhat offset by the large number of optometrists who, because of their age, will be lost to the profession during the next 10 to 15 years due to attrition. In 1973 there were 645 active optometrists between the ages of 50 and 59, and 170 between the ages of 60 and 69.(14) This grouping of optometrists in the older age bracket in California is quite similar to the national pattern.(15)

Projections for optometry manpower needs are highly variable. In 1975 UCB and SCCO admitted a combined total of 160 students in optometry. Definitive estimates regarding the impact of a national health insurance program on optometry manpower demands are not available, although the California experience with Medicaid may be a useful index for this purpose.

There are several major issues which relate to projecting future optometric manpower needs and recommended enrollments for California. These are briefly outlined below:

a. Uncertainty regarding the ideal optometrist/population ratio. This uncertainty is compounded by the overlapping of services provided by ophthalmologists and optometrists. Apparently opthalmologists provide some limited optometric services in California and California enjoys a relatively high ophthalmologists per population ratio. Estimates of the necessary ratio for optometrist/population range from 1/7,000 to 1/12,000.(6)

b. There is inadequate information regarding the feasibility of training lower level personnel to assist the optometrist and thereby increase his patient capacity without affecting the quality of care. A national study of optometrists' attitudes regarding utilization of ancillary personnel proved to be very positive.(9) A similar study of California optometrists' attitudes towards the use of paraoptometric technicians was also positive. Optometrists who had been in practice for less than five years projected that they could increase their practice capacity by about 30% through the utilization of trained technicians.(13)

Merritt College in Oakland offers an accredited Optometric Assistant Program, 3 semesters in length in which students attend 2 evening classes a semester for 3 semesters. Each year 12 to 14 students graduate and they, according to school sources, have all met with excellent success as concerns employment.

Elsewhere in the country, there are 8 one-year programs designed to train paraoptometric personnel and approximately 17 two-year programs leading to an Associate degree.

It seems reasonable to assume that with the use of more optometrists in prepaid group practice settings or in government-supported HMO's, that properly trained paraoptometric personnel could be utilized effectively and efficiently.

c. Uncertainty regarding the change in proportion of out-of-state vs. California student entrants at the SCCO. (Californians have dropped from 75% of the 1970-71 class to only 23% of the 1975-76 class.) Projected enrollment figures for the 1976 SCCO entering class show only 10 to 20 California resident students (less than 21% of the 96-member class). The remainder of the training slots will be reserved for out-of-state contract students. Several states (e.g. Idaho and N. Dakota) require one year of service within the home state for each year of the contract. Other states, such as Wyoming, allow the student full freedom in his selection of a resident practice site.(11) Should the trend toward greater selection of non-Californians at the SCCO continue, it may seriously effect the State's optometric manpower situation. During a fifteen year period (1960-74), 79.4% of the SCCO graduates resided in California.(10)

The major recommendations regarding optometry education in California are:

a. the development of experimental training programs for optometric technicians;

b. the development of contingency planning for a State contract program with the SCCO or expansion of the UCB program;

c. no immedicate increase in enrollment at the state-supported UCB program unless and until national health insurance provisions for optometric services are instituted.

TABLE VIII-1

U.S. SUPPLY OF ACTIVE OPTOMETRISTS AND OPTOMETRIST/POPULATION RATIOS

Actual 1970; Projected 1975-1990

	1970		1975		1980		1985		1990	
	number	rate*	number	rate*	number	rate*	number	rate*	number	rate*
Basic methodology[1]	18,400	9.0	19,700	9.2	21,800	9.6	24,500	10.2	28,000	11.2
Low alternative[2]	18,400	9.0	19,700	9.2	21,700	9.6	23,600	9.9	25,300	10.1
High alternative[3]	18,400	9.0	19,700	9.2	21,900	9.6	25,100	10.5	29,900	11.9

*rate per 100,000 population; based on U.S. Census Report and Projections, resident population:

1970 - 203,805,000
1975 - 214,883,000
1980 - 226,934,000
1985 - 239,329,000
1990 - 250,630,000

Three methodologies were used to account for the impact of future funding on optometry school first year enrollment:

1 - assumes a moderate increase in enrollment

2 - assumes a stable enrollment remaining at the 1974-75 level

3 - assumes a higher increase, slightly more than 1½ times that of the basic methodology

Notes: Figures include all active optometrists in the 50 States and the District of Columbia.

Projections include all optometrists active 12/31/70 plus the estimated number of graduates for the twenty-year period minus the estimated number of optometrists lost due to retirement and death.

Source: The Supply of Health Manpower, 1970 Profiles and Projections to 1990, U.S. Department of Health, Education and Welfare, December 1974, chapter 6.

2. SUPPLY TRENDS AND PROJECTIONS

Licensure Data: It is estimated that there are currently 19,700 active optometrists in the U.S., or a ratio of 9.2/100,000. This supply is projected to increase to 21,800 in 1980 (ratio of 9.6/100,000) and 28,000 in 1990 (producing an estimated ratio of between 10.1 and 11.9/100,000, depending on the enrollment increase in optometry schools).(4) In 1920 and 1960 the ratios were 13.7 and 11.0 optometrists per 100,000 in the Unites States.(10) (See TABLE VIII-1)

The professional optometrists generally agree that the optimum ratio of optometrists to population is 1/7,000. The national average ratio is 1/11,000. The U.S. Department of Health, Education and Welfare has established a ratio of 1 optometrist per 15,000 population to provide minimum optometric services. The estimation of California's ratio, in 1972 was approximately 1 optometrist per 8,416 population. (See TABLE VIII-2) California ranks seventh highest nationally in the ratio of optometrists to population.(6)

TABLE VIII-2

Population Estimates for Selected States
Ratio of Population to Optometrists for 1972

State	Population/ Prac. O.D.	Rank
Arizona	14,301	36
California	8,416	7
Florida	13,645	35
Illinois	7,180	1
Maryland	20,485	49
Michigan	12,077	29
Montana	7,815	4
New Jersey	11,457	26
New York	11,351	24
North Carolina	16,345	43
Ohio	11,351	25
Oklahoma	10,751	21
South Dakota	7,895	5
Texas	15,227	40

TABLE VIII-3

LICENSED OPTOMETRISTS IN CALIFORNIA BY COUNTY

TYPE - OPTOMETRIST 12/30/75

1	ALAMEDA	202	31	PLACER	13
2	ALPINE		32	PLUMAS	1
3	AMADOR	1	33	RIVERSIDE	56
4	BUTTE	19	34	SACRAMENTO	90
5	CALAVERAS	3	35	SAN BENITO	3
6	COLUSA	1	36	SAN BERNADINO	87
7	CONTRA COSTA	76	37	SAN DIEGO	213
8	DEL NORTE	2	38	SAN FRANCISCO	143
9	EL DORADO	8	39	SAN JOAQUIN	51
10	FRESNO	59	40	SAN LUIS OBISPO	19
11	GLENN	2	41	SAN MATEO	58
12	HUMBOLDT	10	42	SANTA BARBARA	35
13	IMPERIAL	5	43	SANTA CLARA	129
14	INYO	3	44	SANTA CRUZ	22
15	KERN	38	45	SHASTA	13
16	KINGS	13	46	SIERRA	
17	LAKE	3	47	SISKIYOU	7
18	LASSEN	3	48	SOLANO	19
19	LOS ANGELES	1,058	49	SONOMA	38
20	MADERA	5	50	STANISLAUS	35
21	MARIN	28	51	SUTTER	7
22	MARIPOSA		52	TEHAMA	6
23	MENDOCINO	9	53	TRINITY	1
24	MERCED	8	54	TULARE	27
25	MODOC	1	55	TUOLUMNE	5
26	MONO	29	56	VENTURA	56
27	MONTEREY	15	57	YOLO	15
28	NAPA	5	58	YUBA	5
29	NEVADA	228	59	OUT OF STATE	544
30	ORANGE		60	OUT OF COUNTRY	34
				PREFIX COUNT	[illegible],566

SOURCE: Board of Optometry.

An HEW survey of 1973 showed that there were 2,675 optometrists in California, of which 88% were active.(14) The California Board of Optometry reported 3,566 licensed optometrists as of December 30, 1975, of which 544 were out of state and 34 were out of country (leaving a remainder of 2,988). (See TABLE VIII-3) If 88% of the licensees are active, we can estimate the present California supply of optometrists at 2,629. It should be noted that 1,058 of these total licensees are located in Los Angeles County, whereas four counties in California have no licensed optometrists in residence.(3)

Migration: California has experienced an immigration of optometrists over the years, averaging 15.6 per year since 1955. This immigration by optometrists has not kept pace, however with the total population immigration during the same period.(10) (See TABLE VIII-4) The California Postsecondary Education Commission found that for a three year period (1971-73) an average of 23 optometrists per year from other states established practices in California.(6) It is more important to look at the migration

TABLE VIII-4

Ratio of Immigration of Optometrist To
Net Immigration of Population (0.0.S. / 100,000)

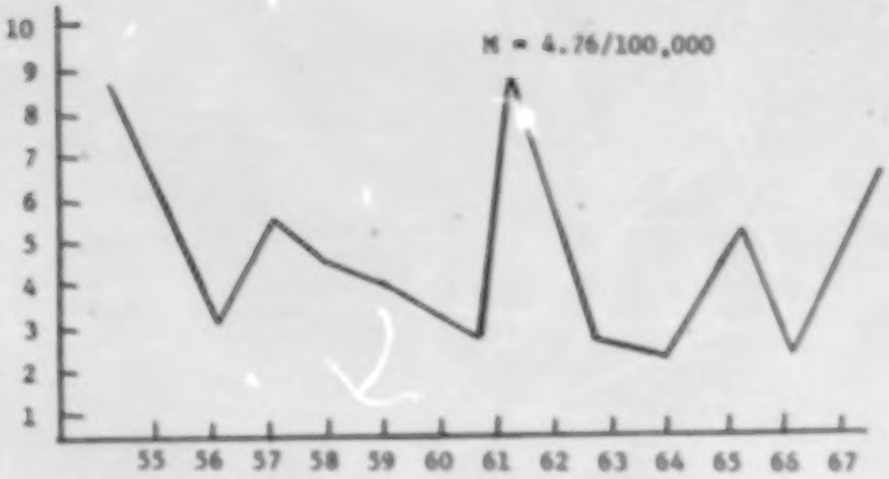

TABLE VIII-5
SOUTHERN CALIFORNIA COLLEGE OF OPTOMETRY

MIGRATION FLOW OF OPTOMETRISTS
1960 - 1974

YEAR OF GRADUATION	TOTAL GRADUATES	AT GRADUATION CALIF./NON-CALIF.		CURRENT LOCATION CALIF./NON-CALIF.	
1960	44	37	7	36	8
1961	39	34	7	27	2
1962	29	24	7	27	2
1963	36	26	10	31	5
1964	34	29	5	30	4
1965	32	28	4	28	4
1966	33	27	6	25	8
1967	52	41	11	43	9
1968	53	48	5	45	8
1969	No Program				
1970	49	41	8	34	15
1971	52	39	13	38	14
1972	59	41	18	45	14
1973	57	38	19	43	14
1974	61	47	14	48	13
TOTAL	630	500	130	505	125
		79.4%	20.6%	80.0%	20.0%

SOURCE: Hopping's Optometric Manpower Report.

of optometrists who graduate from California schools. The registrar of the Southern California College of Optometry reports that about 80% of their graduates from the period 1960 through 1974 are located in California.(10) (See TABLE VIII-5) The California Postsecondary Education Commission recently report that about 80% of the University of California at Berkeley's out-of-state students stay in California.(6)

Hopping reports that between 1970 and 1975, 22 of the 254 optometry graduates of UCB (or 8.7%) were listed as having non-California residency.(10) (See TABLE VIII-6)

TABLE VIII-6
University of California, Berkeley
School of Optometry
1970 - 1975

YEAR OF GRADUATION	TOTAL GRADUATES	AT GRADUATION CALIF.	NON-CALIF.
1970	39	34	5
1971	33	30	3
1972	51	45	6*
1973	44	40	[illegible]
1974	56	55	1
1975	53	50	3**
TOTAL	276	254	22
AVERAGE	46	42.3	3.67

*1972 - 1 Foreign Country

**1975 - 2 Foreign Countries

SOURCE: Hopping's Optometric Manpower Report.

TABLE VIII-7

ASSOCIATION OF SCHOOLS AND COLLEGES OF OPTOMETRY

Annual Enrollment Report
Academic Year 1973-74

School	Year of Graduation				
	1974	1975	1976	1977	Total
Univ. of Alabama at Birmingham	12	25	25	24	86
Univ. of California, Berkeley	56	54	53	58	221
Univ. of Houston	60	62	75	66	263
Illinois College of Optometry	116	105	143	151	516
Indiana University	62	58	69	69	258
Massachusetts College of Optometry	74	64	62	82	282
State College of Optometry-SUNY	0	18	23	24	65
Ohio State University	49	51	53	57	210
Pacific University	67	71	69	73	280
Pennsylvania College of Optometry	109	112	151	141	513
Southern California College of Optometry	61	58	70	91	280
Southern College of Optometry	131	134	150	141	568
TOTAL	797	813	943	989	3542
University of Montreal	31	37	48		116
University of Waterloo	58	57	54	60	229
	89	94	102	60	345
					3387

GEOGRAPHICAL ORIGINS AND YEAR OF GRADUATION

California	114	100	115	107	436

SOURCE: Hopping's Optometric Manpower Report.

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Enrollment Data: There are currently 12 schools or colleges of optometry in the United States which are accredited by the Council on Optometric Education--one in Florida, one in Missouri, and one in Michigan are tentatively scheduled to open before mid 1976.(1) A total of 813 optometrists were graduated in 1975, of which 110 were graduated from the two California institutions. It is estimated that a total of 989 optometrists will be graduated nationally by the year 1977, of which 144 will be products of California institutions.(10) (See TABLE VIII-7) The pattern of optometric degrees conferred over a ten year period by UCB and the SCOO, may be seen in TABLE VIII-8. Between 1966 and 1976 there will be more than a 100% increase in optometrist graduates in California.

TABLE VIII-8

Degrees Conferred By California Schools and Colleges
Of Optometry 1966-1975 and Projected for 1976 & 1977

School											Projected	
	1966	1967	1968	1969*	1970	1971	1972	1973	1974	1975	1976	1977
UCB	26	29	43	1	39	33	48	44	57	52	54	59
SCOO**	33	52	53	0	49	52	59	57	61	58	63	85
TOTAL	59	81	96	1	88	85	107	101	118	110	117	144

*Year of transition from 3 to 4-year professional curriculum.

**Southern California College of Optometry.

SOURCE: Compiled from data submitted to the California Health Manpower Study Office by Individual Optometry Schools, Fall 1975 and Spring 1976, and material compiled by R. Hopping of the S.C.C.O.

Projected Supply and In-Migration of Optometrists

A detailed description of the methodology for projecting the future supply of optometrists in California is described in Appendix E, together with a base case projection in which observed past patterns and trends are assumed to continue into future years. In this projection methodology, estimates are made of expected losses or attrition in the existing (1975) supply of optometrists. as are expected gains or additions from new California graduates and new in-migrations. A summary of the base case projection is shown in TABLE VIII-9.

TABLE VIII-9 . Base Case Projection of California Optometrists(20)

	1975	1980	1985	1990
Total Licensed	2,988	3,257	3,741	4,193
Total Active	2,639	2,916	3,353	3,778
From 1975 Supply		2,280	1,988	1,584
In-Migration		187	408	663
New Graduates		449	956	1,530
Optometrists per 100,000	12	12	13	14

a. Educational Output

In this base case projection, it was assumed that the future rate of growth in California optometry education programs would be equal to the rate of growth for the United States, as estimated in reference 19. The annual rate of growth is as follows: .0262 for the 1976-80 period, .0340 for the 1981-85 period, and .0340 for the 1986-90 period. These rates of growth were chosen to provide a basis of comparison with the results for the United States, as shown in TABLE VIII-10.

TABLE VIII-10. Comparison of United States and California Past and Base Case Projected Future Supply of Active Optometrists(20)

	United States *		California	
	Active Optometrists	Optometrists per 100,000	Active Optometrists	Optometrists per 100,000
1965	16,100	9	2,100	13
1970	18,400	9	2,300	12
1975	19,700	9	2,600	12
1980	21,800	10	2,900	12
1985	24,500	10	3,400	13
1990	28,000	11	3,800	14

* Source: DHEW, The Supply of Health Manpower, December 1974.

These results show that the basic methodology and base case projection described in Appendix E are consistent with the methodology and assumptions used in the national projection. The trend in the number of optometrists in California per 100,000 matches that projected for the U.S. very closely.

The actual rates of growth in future educational output of trained optometrists in the state of California is, in fact, likely to depart from the national average and will be determined in part by state policy. However, as stated above, the methodology employed for projecting future supply can be used to examine the impacts of alternative assumptions. A complete description of the sensitivity analyses performed on the impacts of various assumptions is contained in Appendix D. A summary of the results of the impacts of changes in educational output considered in this Appendix is shown in TABLE VIII-11.

These results show, as would be expected, that the future California supply of optometrists is quite sensitive to the rate of growth in educational output. Each percentage of increase in the growth rate relative to the base case rate produces about a 2.5 percent increase in the number of optometrists per 100,000.

TABLE VIII-11. Sensitivity of Future Optometrists Supply to Future California Educational Output (20)

	Change in Growth Rate	1985 California Graduates		Active Optometrists per 100,000	
		Number	Change	Number	Change
Base Case		144		13	
Alternative 1	+2.5%	184	+28%	14	+ 8.3%
Alternative 2	+5.0%	235	+63%	14	+16.7%
Alternative 3	+10.0%	381	+165%	15	+25.0%

Table VIII-11 also illustrates the significant implications for educational output requirements of changes in the target ratio of optometrists per 100,000. The 5.0% increase in the ratio implies almost a 65% increase in the level of graduate output. Thus, each percentage change in the 1985 ratio corresponds to about a 9% change in output.

b. Migration

From past trends it was assumed in the base case projection that the in-migration rate of optometrists trained outside the state would be equal to 5.06% of the total number trained in the United States each year and that the retention rate for California graduates was .818. As with the assumption on the rate of growth of graduate output, the methodology can also be used to examine the impacts of changes in migration patterns.

Consider, first, the in-migration rate. Table VIII-12 shows the impact of changes in the rate of inflow.

These results indicate that future supply is relatively insensitive to changes in the assumed rate of in-migration for the ranges considered.

TABLE VIII-12. Sensitivity of Future California Optometrist Supply to Future (20)

	In-Migration		1985 Active Optometrists per 100,000	
	Rate	Change	Number	Change
Base Case	.0506		13	
Alternative 1	.0455	(-)10%	13	0.0%
Alternative 2	.0375	(-)25%	13	0.0%
Alternative 3	.0253	(-)50%	12	8.2%

Table VIII-13 shows the impact of changes in the retention rate of California graduates on future supply. As can be seen from Table VIII-13 the optometrists per 100,000 ratio is also insensitive to the assumed rate of retention (or, converseely, the rate of out-migration) for the range of changes considered.

TABLE VIII-13. Sensitivity of Future California Optometrist Supply to the Retention of California Graduates (20)

	California Graduates Retention		1985 Active Optometrists per 100,000	
	Rate	Change	Number	Change
Base Case	.818		13	
Alternative 1	.777	(-) 5.0%	13	0.0%
Alternative 2	.736	(-)10.0%	13	0.0%

TABLE VIII-14

FIRST YEAR (ENTERING CLASS) OF STUDENTS IN CALIFORNIA SCHOOLS OF OPTOMETRY BY SCHOOL AND LEGAL RESIDENCE PRIOR TO ADMISSION, 1975

	Percent of Students			
Schools	California	Other U.S. States	Foreign	Total
U.C. System				
U.C.B.	85.9 (55)	10.9 (7)	3.1 (2)	99.9 (64)
Private				
So. California College of Optometry	22.9 (22)	76.0 (73)	1.0 (1)	99.9 (96)
Grand Total	48.1 (77)	50.0 (80)	1.9 (3)	100.0 (160)

SOURCE: U.C. Data from Office of the Special Assistant to the President--Health Affairs
S.C.C.O Data from the Office of the President, Southern California College of Optometry

TABLE VIII-15

FIRST YEAR (ENTERING CLASS) OF STUDENTS IN CALIFORNIA SCHOOLS OF OPTOMETRY BY SCHOOL, SEX, AND ETHNIC GROUP--1975

	Ethnic Origin					Total	Sex	
School	Asian American	Black	Caucasian	Chicano	Other		M	F
U.C.B.	13	1	46	4	-	64	50	14
S.C.C.O.	10	1	82	3	-	96	87	9
Total	23	2	128	7	-	160	137	23

SOURCE: Compiled at the Health Manpower Study Office from information submitted by the individual schools, Fall 1975 and Spring 1976.

Educational Opportunities

The two schools of optometry in California take in about 14% of the entering students throughout the country each year.(18) Tumelty's(17) analysis of educational opportunities in optometry shows that for the criterion year (1975) only 9 of the 64 entering UCB students were from other states and foreign countries. At the SCCO, California residents presently occupy only about 22% of the first year slots. (See Table The proportion of non-California students at SCCO will undoubtedly increase in the future as the institution increases its contractual obligation to train students from other states. The California Optometric Association estimated in the 1973-74 academic year that 67 Californians were enrolled in out of state optometry schools.(13) In the 1972-73 academic year 79% of the openings in the two California Schools of Optometry were filled by California residents.(5)

At the state-supported UCB School of Optometry the 1975 entering class was overrepresented with Orientals and underrepresented for Blacks, Mexican-Americans and Caucasions. In respect to representation it should also be noted that there are only 14 female students in the 1975 entering freshmen class at UCB and 9 at SCCO. (See Table

TABLE VIII-16

NUMBER OF OPTOMETRISTS, BY ACTIVITY STATUS AND AGE: CALIFORNIA, 1973

Activity Status	All Ages[1]	Age in Years Under 30	30-39	40-49	50-59	60-69	70 and over
Total	2623	287	468	706	724	227	127
ACTIVE	2312	273	452	635	645	170	68
Working 30 or more hours	1887	238	389	528	527	115	34
Working less than 30 hours	425	35	63	107	118	55	34
INACTIVE	302	14	14	69	78	55	58
Retired	129	0	1	6	22	40	52
Unemployed	28	9	2	8	4	4	1
Recent graduate[2]	8	8	0	0	0	0	0
Other unemployed	20	1	2	8	4	4	1
All other inactive	145	5	11	55	52	11	5
Not reported	9	0	2	2	1	2	1

[1] Includes those optometrists who did not report year of birth.

[2] Graduate of optometry school within past 12 months.

SOURCE: Hopping's Optometric Manpower Report.

TABLE VIII-17

NUMBER AND PERCENT DISTRIBUTION OF ACTIVE OPTOMETRISTS BY AGE & SEX: California, 1973*

Age in Years	Number of Active Optometrists			Percent Distribution		
	Both Sexes	Male	Female	Both Sexes	Male	Female
All Ages[1]	2312	2244	65	100.0	100.0	100.0
Under 30	273	263	10	11.8	11.7	15.4
30-39	452	445	7	19.6	19.8	10.8
40-49	634	619	15	27.5	27.6	23.1
50-59	645	628	17	27.9	28.0	26.2
60-69	170	160	10	7.4	7.1	15.4
70 and over	68	67	1	2.9	3.0	1.5
Not reported	67	62	5	2.9	2.8	7.7

[1] Includes three optometrists who did not report sex.

*U.S. Dept. of Health, Education Welfare, Public Health Service, "Licensed Optometrists of California, P. 6, June 1974.

SOURCE: Hopping's Optometric Manpower Report.

3. DEMAND AND PROJECTIONS

There are not much data available regarding the demand for optometrist's services. In 1973 a study of California optometrists showed that 69 professionals between the ages of 40 and 49 were inactive, and 425 were working less than 30 hours per week.(14) (See Table VIII-16) In a 1968 study of California optometrists many respondents indicated an interest in the use of optometric technicians to increase their patient care capacity.(13)

Accurate estimates of future optometric manpower needs are also difficult to arrive at. The California Employment Department estimates that between 1975 and 1980, market demand and attrition (replacement) factors will account for 1832 optometrist position openings (an average of 366 per year).(8) (See Appendix E, Page E-1). If the somewhat controversial "ideal" ratio of 1/7,000 is utilized there would have been a deficit of 275 optometrists in California in 1973. (7) Obviously, available financing for vision care and changing patterns of personnel utilization will effect the real need for future optometric manpower.

Hopping has estimated that UCB and SCCO would have to admit about 158 (combined totals) first year students each year until 1990 in order to maintain the present optometrist to population ratios. The two schools collectively enrolled 160 first year students during the current year. If one accepts the goal of eventually achieving an ideal ratio of 1/7,000 in California, the two schools would have to admit an average of 204 entering students each year through 1990.(10)

A factor which will impact upon California and the nation's supply of optometrists is the large proportion of older professionals. 65.7% of the active optometrists are over forty years of age and 38.2% are over fifty years of age.(14) (See TABLE VIII-17)

Impact of National Health Insurance: Estimates of the optometrist to population ratios which would be required for a national health insurance program vary significantly. Hopping suggests a range from 1/4,000 to 1/7,840. To achieve such ratios would require a total nationwide supply of approximately 33,105 to 33,430 optometrists by 1980.(10) In England and Wales where a national health plan exists, the ratio of optometrists to population was reported as 1/10,057.(6) The introduction of Medicaid in California resulted in about a 10% increase in utilization of optometric services, and this may be used for future purposes as a general guideline.(13)

4. TRENDS IN UTILIZATION PATTERNS

An analysis of the primary specialty practice of California optometrists was conducted in 1973, (this report is summarized in R. Hopping's report to the California Postsecondary Education Commission in Table 21).(14) The vast majority listed their primary specialty as contact lenses, vision training or occupational vision. As the demand for optometric service increases it is anticipated that the trend toward greater specialization will increase.

A national study in 1973 of 18,141 practicing optometrists reported that 70% (12,703) were specialists. The remaining 30% were either in general practice or did not specify a practice area. The younger practitioners were more likely to be involved in specialty practice (e.g. 82% of

5. CLINICAL TRAINING SITES

SCCO currently has major clinical training facilities in Los Angeles, Baldwin Park, Riverside and Fullerton. Additional clinical affiliations are planned to be located in Long Beach, Los Angeles and Pico Rivera. Screening programs are provided to over 45 schools in Los Angeles, Orange and Riverside Counties. One clinical outreach program (Baldwin Park Health Satellite) is funded by HEW and serves the San Gabriel Valley Region, which has a substantial Mexican-American population.

UCB has three clinical outreach programs. One is located in Daly City where a prepaid health clinic functions with four interns three afternoons per week. Another is located in the Veterans Administration Hospital where 3 or 4 students spend a quarter with near blind patients under the supervision of a jointly appointed faculty member. The third program is affiliated with the Lions Club Blind Center in Oakland who contracted with UCB to provide rehabilitation services for the near blind faculty and four students are regularly involved in this optometric rehabilitation program. UCB is also investigating the development of a downtown San Francisco center and a Veterans Administration residency program.

the 30-39 year age group) than the older practitioners.(15) These findings suggest that the optometry curricula and clinical training is becoming more specialized and that future graduates may continue to seek specialized modes of practice. Such a trend may lend itself to optometry group settings which may or may not be part of a prepaid health program.

The trend toward optometric specialization resulted in the AOA conducting two studies on the subject (1968 and 1973). The Report of the Project Team for the Restudy of Certification of Optometric Specialties in 1973 recommended the development of specialty identification and certification mechanisms, but to be conducted in such a manner as not to restrict the scope of the general practice of optometry.(12) There is presently only limited information regarding the potential value of training auxiliary personnel to perform some of the routine responsibilities of the optometrists.(2)

6. RECOMMENDATIONS

The following recommendations regarding optometry education are presented for consideration by the California Postsecondary Education Commission.

1. The State should encourage the development of experimental training programs to test the feasibility of utilizing optometric technicians in a variety of health care settings. Such studies should be oriented to task analysis, provider acceptance, consumer acceptance, cost efficiency and effect upon the quality of vision care services. These programs may be appropriately initiated under the auspices of the experimental health manpower training provisions of AB 1503.

2. The State should monitor the impact of the trend on the part of the SCCO to enroll out-of-state students upon the California optometric manpower situation. Annual analyses should be made of the change (if any) in the proportion of SCCO graduates who establish their optometric practice outside of California. If this factor significantly affects the optometrist license supply in California over a period of 2-3 years then the state should consider the establishment of a contract program with the SCCO.

3. An alternative recommendation to the establishment of a contract program with SCCO (#2 recommendation) is expansion of the UCB program to make up the difference in the declining enrollment of California students at SCCO. Such an expansion should include clinical outreach programs to the northern and southern portions of the State. The State should conduct a cost effective comparison of a contract program with SCCO versus a program expansion at UCB.

4. No additional enrollments are recommended for the UCB program beyond those already projected. UCB and SCCO enrolled 64 and 96 first year students respectively in the current year (a total of 16). If Hopping's(10) pro-

jection that California schools will have to admit a combined total of approximately 158 students per year in order to maintain the present optometrist/population ratio. The State is currently meeting that objective. This recommendation is predicated upon the State's monitoring of the change in the mix of California to out-of-state students at the SCCO and the subsequent impact upon licensure patterns (recommendation #2). It should also be noted that the enrollment recommendation is based upon the lack of sufficiently compelling rationale to increase the ratio of optometrists to population in California which is presently 1/8,416 (the seventh highest rank in the country.) HEW identified the minimum ratio as 1/15,000 and England-Wales with a national health service has a ratio of 1/10,057. Given the latter figure, the AOA recommended ideal of 1/7,000 seems to be somewhat liberal. Furthermore, after intensive study of the ratio issue, the State Council of HIgher Education of Virginia arrived at the conclusion that a ratio of 1/14,600 was sufficient to meet their state needs.(16) Kaiser Permanente of Los Angeles maintains a ratio of 1/18,750. A comparative study of six large prepaid group health plans showed a range of 1/12,000 to 1/18,800 in the optometry/patient ratio.(15)

It must be remembered that the fee-for-service pattern of optometric care is a self-restricting system of demand. With a more accessible system of care, such as may be provided under national health insurance the demand for services may increase in quantum fashion. Or stated in another way, the present demand for optometric services may bear little relationships to the need for services; an issue which was not within the purview of this analysis.

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The state should, on an interim basis, be prepared to support an additional enrollment of about 10% for optometry education in the event of passage of national health insurance legislation which includes an optometry services provision. This recommendation is based upon the effect of Medicaid upon the demand for optometric services. The 10% enrollment figure should only be used as an academic planning guideline and should be revised in relation with the specific provisions of any national health insurancelegislation and the availability of more definitive analyses of manpower requirements.

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IX. HEALTH SCIENCES EDUCATION - THE NEXT DECADE

1. INTRODUCTION

Health is a fundamental expectation for all Americans. It may be defined in many ways. We consider health for Californians as an optimum state of personal well-being, which provides an opportunity to enjoy physical and emotional happiness without anxiety or discomfort.

Ethnic, geographic, financial and societal factors have, in the past, combined to impede or even prevent an individual from achieving physical and mental health. *Achievement of an optimum state of well-being for all individuals in our society is an extremely complex, costly and comprehensive undertaking in which the health professions (education and service) can only play a contributing, albeit important, part.*

The preceding reports have all addressed the issues of manpower supply and demand in California and the ways in which societal forces can affect them. The impact of National Health Insurance and malpractice problems, the rational training and distribution of specialists, stability of migration patterns of all health professionals, the suitability of midlevel health practitioners, the existing and needed mix of health education opportunities in California, the new or changed roles of the various health professionals including dentistry, medicine, nursing, optometry and pharmacy - all will help determine how health sciences education can and should facilitate, lead, or respond to needed changes in the health care system.

2. BACKGROUND

Two themes run throughout this paper, and the analyses and recommendations should be viewed in relation to them.

First, we must recognize that issues of sanitation, immunization, nutrition, emergency care and basic life support requirements have been pervasive in decreasing sickness and suffering. The primary thrust of the health industry (including the education and compensation of physicians) has been oriented to the treatment of sickness. Relatively little concern (excluding dentistry) has been given to wellness. *In those areas where the health professions can and should play a role, that role should be strengthened.*

Second, the acceleration of change in all segments of our society, and especially in health care, require us to demand *maintenance of professional competence* via various aspects of continuing education, while insuring skills of the practitioner to maintain a positive relationship with all people - healthy or nonhealthy. In addition, *sharing of increasingly complex tasks and technology* in the provision of care must be included in the education of providers of that care.

3. CHANGES IN HEALTH SCIENCES EDUCATION

The existing health professions schools have served society well. The general quality of practitioner and care are high in this country. However, no country or institution has yet successfully achieved education in a curriculum where competency and performance are the measures for progress through the educational system and where meaningful horizontal and upward mobility are allowed and facilitated.

The quality and orientation of education necessary for the graduates and for the public are outlined in the following paragraphs. *Needs of health care delivery amenable to educational change are considered first; then more direct changes in the educational process that will support the health care needs are discussed.* Since the major health need of the present and near future seems to be for primary care, the discussion will focus on the basic processes for educating primary care providers. It must be emphasized that this country's success in secondary and tertiary (specialty) care has been magnificent. We must not weaken the pinnacle while shoring the base of our capacity.

A. Health Care Delivery and System Needs

Maintenance of Excellent Secondary and Tertiary Care Providers. Current health professions training, particularly in medicine and nursing, provides excellent secondary and tertiary care providers. Any educational changes that evolve should not dilute the quality of training that is currently provided. Although the quantity of specialists trained in a given field may need to change, as discussed in previous reports, the base of scientific and technical knowledge must be strengthened and taught appropriately.

Improved Attitude Toward Primary Care by Graduates. Society is experiencing a recent change in attitude toward the value and desirability of careers in primary care delivery. In the past, both curriculum orientation and faculty role models have not been devoted to primary care. Moreover, the financial rewards and status of secondary and tertiary care providers have been highlighted and emphasized. The delivery system must change to make primary care a more desirable field for the practitioner by providing improved working conditions and professional support. Major studies to explore important factors regarding career choice and professional satisfaction with primary care are currently being carried out (Gough, 1975; Plovnick, 1975; Robert Wood Johnson Foundation, 1974, 1975).

Maximizing Recognition and Involvement of All Providers. The ability to recognize and involve all providers to utmost capacity is required by the health delivery system so that human dignity may be maintained while frustration and overtraining is decreased. Too often a health professional is led during training to expect to perform certain tasks or accept responsibilities that are later denied to him in the real world of practice. We can and must *minimize the disparity between education and practice* while improving the quality of education in every discipline. This can be done by creating curricula that are empirically determined from the health care problems that professionals face and the tasks they perform. The closer the curricular content matches practice, the more realistic will be the education.

Humanistic Patient Care. The public is suffering from the increased fragmentation and specialization of our health care system. Health professional curricula are primarily disease-oriented. The interpersonal needs and psychological impact that sickness creates receive less emphasis. A patient must feel that his primary problems are heard and are being addressed by the health care provider and system. The emotional impact of disease on a patient's life, his feeling of well-being, and his ability to be happy and productive - whether the medical problem is minor or major - are pervasive. Failure of the health professional to deal adequately with this aspect of health is a major source of public dissatisfaction with the health care system. *Re-emphasizing the humanistic aspects of patient care, using admirable practitioners as* *role models and exploring patient/provider and provider/provider relationships during the period of professional training - all will help to deal with this problem* (Jason, 1975). Interweaving these concerns into the curricula as they directly relate to patient problems, rather than as a separate discipline or "course" unto itself, will help train professionals to apply them effectively to care of patients.

Enhanced Communication Skills. Most health care is delivered by more than one person in any given setting, be it by a private practitioner and his office assistant or a multiprofessional group. In such a setting, learning each other's roles and skills and how to work effectively with each other, and learning to help solve the patient's problems in a coordinated fashion are necessary tasks in the development of competence. *The skills required for effective communication, both with colleagues as well as with patients, can be taught and learned.* Recent developments in the behavioral sciences have made it feasible to teach these skills explicitly, provide adequate opportunities for practice and feedback (e.g., using videotape), and monitor and evaluate their achievement (Hollister & Edgerton, 1974; Werner & Schneider, 1974).

Improved Prevention via Patient and Health Education. If the population can be motivated to maintain its health and, hence, prevent potential disease, substantial financial impact on our society is possible (Stamler, 1973; White, 1975). Health education and patient education along with new ways of helping to motivate people and change behavior are most relevant for health professions education (Pomerleau, Bass & Crown, 1975). *All health professionals should be explicitly taught methods for effective health and patient education, including* *ways to help a patient change long-standing habits and life styles* (La Don, Sherwood and Hughes, 1975). Education of patients is a basic need if we are truly to change the negative health habits of a large proportion of our population. It will be necessary to develop an attitudinal shift and behavioral change in a large percentage of the population. Only by this can we help individuals change their life styles, should they desire to implement strategies to avoid or minimize the large number of preventable chronic diseases (e.g., emphysema, hypertension, obesity).

Moreover, *our training institutions must come to value such activities more than they currently do*, and emphasize them in more appropriate balance to the emphasis on the diagnosis and treatment of disease. Although patient education has conventionally fallen more frequently to middle-level practitioners, nurses, and office assistants, it may be that the future will include a role reversal, with physicians and dentists utilizing their skill and knowledge to motivate and change patient behavior and the middle-level practitioners performing more of the routine functions involved in the diagnosis and treatment of disease.

Ability of Practitioner to be Current in his Field. Health care knowledge is expanding at phenomenal rates. Once a practitioner is licensed and certified, his accountability to his profession and the public can diminish. Demands for recertification and relicensure are realistic, desirable and achievable (in every profession including medicine, law, teaching, dentistry, nursing, pharmacy, etc.). *Two separate emphases are necessary: (1) to change the basic educational system to provide the student with skills and motivation to be a lifelong learner; and (2) to develop more realistic and fruitful methods of improving the* *knowledge of those practitioners now trained.*

Care must be taken so that a witch hunt is avoided and realistic demands are placed. Again, congruence is required between what a person does and the areas which he is expected to know and in which he must demonstrate competence. Improving methods of assessment, using, for example, simulation, chart audit, and patient reports can help to enhance this congruence (Harless, et al, 1975).

Change in Rewards. At the moment, *our health care system is structured to reinforce and pay for the treatment of sickness rather than the maintenance of health or the prevention of disease.* The commodity of exchange is illness, not wellness. Until there develops a premium for having well patients, there will be little change toward this orientation (either for physicians who are paid mainly for treating sickness medically or surgically or for hospitals which require certain minimum occupancy rates to survive). Moreover, third-party payers need to create incentives and provide insurance benefits that will reinforce prevention and early diagnosis, not simply fewer days in the hospital while care is provided. Furthermore, the educational system needs to change in order to teach practitioners how to change behavior. New knowledge and skills are being refined in the technology of behavior change, and these must be taught, instituted and rewarded by the educational system. Major preventable problems are caused by poor habits and style of life (e.g., obesity, alcoholism, cardiovascular disease and respiratory disease). Changes in a person's habits and life style require major efforts in motivation, hopefully by modifying the individual's and/or the health care system's reward system.

Re-entry and Recycling of Professionals. It is likely that as our health care system changes, so will the skills needed by our health professionals, many of whom will have been in temporary retirement or will have outdated talents. *There is a need for these professionals to be retrained in the same or in a somewhat different occupation.* It may even be cost effective, for example, to "recycle" general surgeons to deliver primary medical care. Furthermore, should our society evolve to a four-day work week with increased leisure time, there is a new potential for an individual to have a second career. This provides new opportunities for personal growth and development.

Little is known about the specific needs and techniques for retraining previously-trained health professionals. *There will need to be dollars to support these students and basic research carried out in order to develop the most appropriate educational program.*

Common to all of these needs are the special characteristics of the mature adult learner, particularly the well-educated health professional. The kinds of education that will be effective will be those that are sensitive to his individual needs and motivation and offered in a manner that can accommodate a working professional.

Data Collection and Dissemination System. An adequate data base does not exist for sharing information on the amount or type of professionals presently performing in the health care delivery system, their tasks, their goals, and their capabilities. Without this information, it will be impossible to consider how many and what type of health professionals will need to be trained and supported in the future. Similarly, it will be impossible to judge which type of health professional and which programs within these types are to receive the highest priority at any particular time. Based partly on techniques now available, and, further, on techniques that must be developed, a data collection and dissemination system must evolve.

A major problem exists until roles and responsibilities are clarified. *We cannot reach clarity of the number and type of health professionals needed until we clarify what role and major area of responsibility each health professional needs.* For example, a large variety of basic screening physical examinations can be carried out by nurse practitioners or physicians' assistants. Another large role in patient education could be carried out by professionals other than physicians. Dentists could assume a larger responsibility for such areas as nutrition and diet. Only by working inter-professionally can we hope to clarify the redundancy and overlap in education that presently occurs. Such redundancy and lack of clarity both increase costs and time and develop a high level of frustration in the graduates who often are not allowed, by law or by custom, to do certain activities for which they have been trained.

It is very difficult to judge the actual range of performance of any type of health practitioner, such as nurse, nurse practitioner, or primary care physician (family practice, general internal medicine, OB-GYN, etc.). Particularly those health professions that classically have been considered to be "supportive" exist with a marked internal variation in competence and responsibility. There does not exist a clear specification of numbers and types of students in the various junior college systems, the state colleges and universities, the University of California system, and private schools. Without a sufficiently sophisticated and nearly mandatory data system that can be developed and implemented in the near future, we will continue not to have adequate information for planning of numbers and types of health professionals.

There must be established, at the state level, a health professions education registry that includes the number and type of active health professionals in training (including both the numbers of students in training and physicians available), and an approximation at the number of positions available in the field. It may be necessary for this registry system to include a description of the tasks that the health professionals can and should perform in order to provide health care at the most reasonable cost.

B. Educational Needs

There is a variety of educational options that can improve the efficiency and effectiveness of health professions education and, ultimately, the quality of care delivered to the public.

Individualized Pacing. People learn at different rates. What is too slow for one may be too fast for another. What is most important, however, is that the student learns what is necessary to become a competent health professional. *By designing educational programs to account for individual rates of learning, health professions education can be available to a broader range of students who will graduate having achieved a higher level of competence.* Thus, both slow and fast learners can progress at their optimum rates, all achieving the required level of competence in the amount of time needed (Block, 1974). Optimum learning can occur: the slow learner can take the time he needs to achieve the acceptable level of mastery; the fast learner's motivation need not suffer from boredom and frustration. Such self-pacing can increase and broaden the opportunities for becoming a successful health professional, particularly by providing a slower learner with the time he needs to achieve competence.

Modular Organization. *Organizing a curriculum around modules that cover a certain small relatively well focused content area (rather than around the larger unit of courses) will allow much greater curricular flexibility* (King et al, 1972; Allen, Hodgson & Martin, 1973). Aside from making it easier for the student to proceed at his own pace, he may be able to take certain modules in a sequence that makes the most sense to him at a time when it is most appropriate for him. Furthermore, new curricular elements can be added or deleted with relative ease. A modular curriculum also makes it easier for a student to test out of those areas in which he has already achieved competence, either by prior experience or training in another environment.

Such modules can also be used for continuing education purposes, particularly in areas such as rural regions of the state where other sources are not as readily available. Modules can also provide a focus around which more than one professional can gather to learn in a cooperative and even interprofessional fashion. The easy availability of continuing education activities (e.g., through modules) may increase motivation to begin practice in underserved areas or to remain in such areas.

Modules are not necessarily self-instructional. A module can combine a variety of educational methods and activities including, for example, one-to-one interaction with a teacher/advisor, clinical experience, practice feedback, evaluation, or group sessions, as appropriate to the learning objectives.

One way to develop modules could be based around the health care problems that professionals face and the tasks that they perform to help resolve these problems. Both can be empirically determined. For example, data on the problems that affect a person's health and for which that person visits a health care provider are beginning to become available (e.g., National Center for Health Statistics, 1974). These problems can form the basic organizational structure for a curriculum independent of the kind of health professional being trained (University of the Pacific, 1975). The differential diagnoses of these problems, the range of organic and functional disorders they imply, and, in addition, the less frequent but more critical emergency problems that threaten life must also be covered by the student. The level and scope of responsibility for each problem necessarily varies with the category of professional being trained.

In addition to data on problems, data regarding the functions or tasks that health professionals perform in identifying and managing health care problems can be utilized in the development of a performance based modular curriculum. For example, a pool of tasks that cover a range of primary care functions for a number of health professionals has been identified (American Association of Medical Clinics, 1973; Gilpatrick, 1974; University of the Pacific, 1973). These tasks can be directly related to the health care problems via specific modules and can form the basis for evaluating competence and determining accountability.

It should further be emphasized that such curricular content need not be static, but, rather, can be regularly revised on the basis of empirically determined shifts in health care needs. New problems or tasks could be added, less relevant ones deleted with minimal expenditure of resources - financial, temporal, or emotional - as compared to a traditionally organized curriculum.

Recognition of Prior Experience. Many potential health professions students have had considerable experience in the delivery of health care. Medical corpsmen, assistants in private medical and dental offices, and other similar individuals have learned a great deal about health care with relatively little accredited training. In addition, there are other health professionals, already trained, who can build upon their existing skills to become proficient in a wider range of activities (e.g., registered nurses who become nurse practitioners). At present, prior relevant experience is usually acknowledged by recognizing formal credit units in a particular content area. Increasingly, students are being permitted to take a "challenge" exam, which tests knowledge in a given area that, if passed, will exempt them from additional course requirements in that area. Most of these challenge exams are written and test only cognitive knowledge. *It is crucial that new challenge exams be devised that test actual relevant clinical performance in simulated or real settings* (Musser, 1973; Grohman, La Duca & Madigan, 1974; Regents External Degree Programs, 1975).

By recognizing prior experience and proficiency, student learning can become more efficient (since students do not have to repeat areas they have already mastered) and institutional cost-saving can result. Modularized curricula can facilitate this. Furthermore, some students can complete their prescribed training in a shorter period of time and make their contributions to the public's health care at an earlier date.

Integrating Continuing Education into the Entire Educational Process. At present, continuing education may or may not be directly related to an individual practitioner's patient care needs. *Developing curricula organized around patient problems and the professional tasks needed to deal with them will allow undergraduate content areas to be directly* *related to continuing education areas of need.*

This provides a direct application of undergraduate curricula to continuing education and could provide a new source of materials which, as discussed earlier, may provide continuing education support in underserved areas.

Furthermore, if skills in becoming a lifelong learner are taught and practiced while the student is an undergraduate, they are more likely to be practiced and maintained after graduation. Such skills include the identification of educational needs, determination of appropriate learning activities to meet the need, and assessment of one's own success in achieving it. *At present, most components of our educational system neither reinforce nor motivate the student to develop these lifelong learning skills and attitudes.* By developing curricula that allow the student to seek out his own learning, rather than receive it more passively, such attitudes and skills can be achieved.

Greater Quality Control. At present, quality control within the health professions educational institutions is variable. The evaluation that is usually done emphasizes recall of factual knowledge more than it does the performance of clinically relevant tasks. By designing the curriculum around what it is that the practitioner must know and be able to do in order to take care of patients (rather than around subject matter areas that develop as bodies of knowledge valuable for their own sake rather than for their application to patient care) and by designing evaluation instruments based on patient care needs, the quality of graduates in terms of their ability to perform their relevant health care functions can be better monitored and assessed.

Improving Evaluation Methodology. *By applying many of the newer* *evaluation methodologies, the important, but less easily assessed, characteristics of a health professional can be measured* (Barro, 1973). Patient simulation using trained actors is one method that can be used to assess interpersonal skills, as well as history-taking and physical examination skills. Simulation using models or other devices is another way that a variety of motor behaviors and recognition skills can be more reliably assessed, particularly in the areas of physical examination. Computer and written simulations can be used to assess problem-solving skills. Student performance in almost any area can be directly recorded on videotape and later analyzed for purposes of both evaluation as well as feedback for improved learning. Peer and self-evaluation are two additional sources of data that can enhance and enrich the description of an individual's competence. It is likely that peer and self-evaluation will become increasingly important as each health professional seeks to maintain his competence and demonstrate accountability. Peer and self-evaluation can be taught and practiced explicitly while the health professions student is still in training.

Educators are becoming more and more capable of specifying in measurable terms the requisite performance for each professional to be trained. Most of these competencies relate to direct patient care, clinical judgments or other decisions, examination or treatment skills, record-keeping or management skills, and exercise of responsibility. At any given stage in a student's education it becomes possible to specify his level of competence in objective, performance-oriented terms. If it were desired that a student advance upward or move horizontally (see below), it would be possible to identify objectively any performance gap between his current and his desired professional role and engage in the appropriate learning activities necessary to bridge that gap. Similarly, *both student and society would know exactly what are the skills and level of performance of an individual certified to be a given professional.*

Horizontal and Vertical Mobility. *By granting credit for prior experience according to performance (rather than by credit units) using improved methods of evaluation, and by developing curricula that are organized in modular fashion, it is possible to enhance the opportunities for horizontal and vertical mobility.* If a student needs to take only those modules for which he has not yet achieved competence, the efficiency of his learning experiences, when moving vertically to a higher level within his profession or horizontally to a different but related profession, will be increased. Structuring the modules into hierarchical systems and identifying overlapping areas of curriculum content in related professions will also enhance mobility.

In addition to granting credit directly for certain demonstrated performance, it should be possible, as an interim measure, to devise a method for translating performance into some sort of relatively standardized credit unit. For example, by assigning degree of difficulty (e.g., as in diving competition) and perhaps by estimating relative amount of needed subject content, *a standardized system can be developed that would achieve a flexible system for granting credit.* Changes in some of the current legal licensure requirements (such as requiring a fixed number of hours in a particular course) may be necessary.

Communicating and Working with Other Health Professionals. The care of patients involves the coordinated efforts of a variety of different categories of health professional. Further, each health professional is now performing new or different tasks. Boundaries between professions are becoming hazy. It is essential for the future of the health care system that one category of health professional be able to work cooperatively and effectively with those in other categories. *Skills in communicating, defining roles, assuming responsibility and planning work assignments will contribute greatly to a more efficient and effective health care system* (Kindig, 1975). Instructional materials for health professionals that address these skills are being developed and refined (Rubin, Plovnick & Fry, 1975).

The team concept in health care education and delivery is an attractive, but as yet elusive, goal. *Efforts must be made to explore team building* to determine whether improved quality and efficiency with lessened cost to the consumer may be obtained. By designing learning experiences around real health care situations in which multiple professionals must work and interact, the team concept can be made realistic.

4. RECOMMENDATIONS FOR THE FUTURE

To implement the proposed ideas, several substantive educational changes will be needed. These changes are based in the educational system and, therefore, by necessity will involve state funding of education. That these changes will have political implications, both within the educational system itself and within the greater political structure of the state, is obvious. Before these changes are attempted, pilot experimental projects should be initiated in order to develop and test the mechanisms, materials, and ideas suggested.

It should again be emphasized that a significant portion of the ills ascribed to health care and health professions education (e.g., high cost, too much specialization, not enough personalized care) are generic societal problems and, thus, will not be alleviated by attention to health care alone.

To make many of the recommendations feasible as well as to enhance mobility throughout the state, a majority of schools eventually must adopt (a) a modular curriculum with the content and features described, as well as (b) the evaluation procedures necessary to implement it (or at least develop a mechanism to relate modules to courses). This is required if a student is to be able to move horizontally or upward in the health professions. At present, whatever mobility exists is implemented through the usual credit-hour system and occasionally through more individualized admissions procedures. However, it is well known that too frequently there is little relationship between the number of credit-hours a student may have acquired and his competence in a given area. *Replacing the credit-hour system with a system based on competence in dealing with specific patient problems or on skill in performing professional tasks will go a long way toward making this mobility more realistic. Furthermore, such a system can demonstrate a direct relationship between the teaching provided and the learning that has occurred. Thus, it will be possible to document explicitly the kind of competence that public monies will achieve and to make clearer decisions about allocation of resources.*

The development of a professionally accepted, high quality and effective modular curriculum will be time-consuming and costly. If there is a substantial commitment made on a public policy level (such as was made federally for early childhood education and reading instruction) and adequate funds allocated, such changes can be accomplished. However, substantial public policy commitment in itself is not sufficient, as may unfortunately be illustrated by the two federal programs just mentioned: *the highway of educational innovation is littered with two kinds of wrecks or failures: underfunding a project designed for the solution to a difficult problem, expecting too much in too little time; or overfunding a project, heavy with administrative expenses and bureaucratic mechanisms, without proper local commitment and regional coordination.*

If a commitment to allocate funds for such a project is contemplated, groundwork for its acceptance at all levels of health professions education is required. Vested interests will need to be rearranged and resistance can be expected. Individuals willing to implement such a program must clearly understand the goals and methods needed and be committed to their implementation.

Realistically, the first step should be to implement an experimental pilot program throughout the state that would develop the basic materials and procedures necessary without disrupting the existing system. Then, students could be admitted to the pilot programs, with careful analysis of student achievement and program success. Should problems develop, students could be incorporated into the existing heath professions programs in the state.

The initial support of pilot experimental programs is essential so that the entire system is not jeopardized by gross or unproven changes.

Components needed for such large scale change are many. Specifically:

A. The health care and educational reward systems must be modified.

Time spent in developing instruction and teaching students must be appropriately recompensed. Moreover, monetary and status reward systems for developing improved methods for health maintenance rather than sickness treatment must be developed and institutionalized.

B. Interpersonal skills must be emphasized in health professions schools. More attention must be devoted to their teaching and more attention must be devoted toward selecting students who already have achieved significant competence in this area.

C. Increased effort and energy toward individualizing education and evaluation must be made. While this will undoubtedly be more costly than our group based methods in the short run, it will enhance opportunities for more individuals. Further, it should develop a much higher level of professional competence that will ultimately improve the health of the citizens of the state and result in cost savings thereby.

D. More flexibility in accepting prior competence must be developed, using performance based methods of assigning credit. Such performance based assessment methods can have a direct impact on the licensure and certification process by providing evaluation procedures that will more directly measure competence to practice than the more abstract, knowledge-based paper-and-pencil examinations. As these procedures are developed in the basic educational programs, they will affect recertification and relicensure procedures as well.

These recommendations cannot be implemented tomorrow. But some are already being experimented with in a variety of schools and locations throughout the country. If there is commitment from our politicians, desire from our informed citizens/consumers, and understanding from our educators, the next five-ten years can bring substantial change in the direction of these recommendations.

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APPENDICES A-E

APPENDIX A

NON-FEDERAL PHYSICIANS IN THE STATE OF CALIFORNIA BY COUNTY AS OF DECEMBER 1975

		ACTIVE							INACTIVE						
		AGE			BOARD	WHERE GRADUATED			AGE			BOARD	WHERE GRADUATED		
COUNTY	TOTAL	ALL AGES	OVER 50	OVER 60	CERTIFIED	CALIFORNIA	OTHER U.S.	FOREIGN	ALL AGES	OVER 50	OVER 60	CERTIFIED	CALIFORNIA	OTHER U.S.	FOREIGN
ALAMEDA	2468	2219	840	347	1196	511	1499	209	249	173	159	65	74	155	20
ALPINE															
AMADOR	20	18	11	3	6	7	9	2	2	2	2		1	1	
BUTTE	197	175	76	25	79	65	101	9	22	22	21	9	13	8	1
CALAVERAS	22	20	14	10	2	10	9	1	2	2	1		1	1	
COLUSA	13	13	10	3	1	6	7								
CONTRA COSTA	1040	939	321	112	507	196	642	101	101	90	80	35	25	67	9
DEL NORTE	12	10	3	2		3	5	2	2	2	2			2	
EL DORADO	82	76	22	10	37	31	42	3	6	6	6	3	4	2	
FRESNO	689	648	256	92	308	198	401	49	41	37	34	6	19	21	1
GLENN	10	10	5	2	2	3	6	1							
HUMBOLDT	151	140	62	23	65	49	80	11	11	10	7	2	5	6	
IMPERIAL	63	59	29	8	30	8	44	7	4	3	2	2	1	2	1
INYO	29	26	13	5	15	15	10	1	3	2	2	1	3		
KERN	413	395	170	82	163	129	220	46	18	17	15	7	7	9	2
KINGS	48	46	24	11	22	23	20	3	2	2	2		1	1	
LAKE	26	18	9	4	6	14	4		8	8	8	1	4	3	1
LASSEN	21	19	10	4	2	7	11	1	2	2	1			2	
LOS ANGELES	16347	15432	5679	2314	7478	4747	8616	2069	915	807	711	294	234	540	141
MADERA	35	32	22	9	2	17	14	1	3	3	2		3		
MARIN	801	715	179	91	403	153	514	48	86	76	65	29	23	56	7
MARIPOSA	12	11	7	3	2	4	6	1	1	1	1		1		
MENDOCINO	106	91	36	15	52	36	50	5	15	14	14	7	7	8	
MERCED	99	92	32	11	47	22	54	16	7	4	3	3	2	4	1
MODOC	4	3	2				2	1	1	1	1			1	
MONO	3	3	2	1		3									
MONTEREY	430	360	142	72	218	89	252	19	70	67	62	34	18	47	5
NAPA	286	246	119	48	118	87	137	22	40	38	37	15	25	15	
NEVADA	54	41	9	4	19	15	26		13	13	12	6	5	8	
ORANGE	3142	2798	811	258	1409	846	1610	342	344	321	304	95	78	228	38
PLACER	137	126	43	16	58	39	80	7	11	11	10	1	4	6	1
PLUMAS	12	11	6	2	2	2	8	1	1	1	1		1		
RIVERSIDE	815	670	308	142	371	203	403	64	145	140	122	42	34	103	8
SACRAMENTO	1454	1379	408	136	716	366	917	96	75	66	56	17	30	32	13
SAN BENITO	14	14	7	4	3	5	6	3							
SAN BERNARDINO	1342	1262	488	176	604	627	514	121	80	71	65	22	40	33	7
SAN DIEGO	3516	3077	824	347	1720	572	2253	252	439	417	376	167	65	335	39
SAN FRANCISCO	3969	3743	1081	471	1856	913	2378	452	226	190	162	71	85	97	44
SAN JOAQUIN	439	408	173	69	206	145	221	42	31	28	28	11	15	13	3
SAN LUIS OBISPO	225	180	68	24	99	50	120	10	45	38	38	11	18	24	3
SAN MATEO	1216	1108	431	160	708	270	742	96	108	84	79	28	31	61	14
SANTA BARBARA	638	554	180	64	328	107	403	44	84	81	75	29	16	58	10
SANTA CLARA	2892	2719	754	249	1859	649	1781	285	173	151	134	68	54	94	25
SANTA CRUZ	264	233	90	48	128	72	143	18	31	31	29	7	9	20	2
SHASTA	147	138	56	17	68	46	84	8	9	8	7		6	3	
[illegible]	2	2					2								

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NON-FEDERAL PHYSICIANS IN THE
STATE OF CALIFORNIA BY COUNTY
AS OF DECEMBER 1975

		ACTIVE							INACTIVE						
		AGE				WHERE GRADUATED			AGE				WHERE GRADUATED		
COUNTY	TOTAL	ALL AGES	OVER 50	OVER 65	BOARD CERTI-FIED	CALI-FORNIA	OTHER U.S.	FOR-EIGN	ALL AGES	OVER 50	OVER 65	BOARD CERTI-FIED	CALI-FORNIA	OTHER U.S.	FOR-EIGN
SISKIYOU	34	29	13	8	14	10	18	1	5	5	4		3	2	
SOLANO	196	181	66	32	75	38	116	27	15	14	12	4	2	10	3
SONOMA	457	393	144	54	218	128	249	16	64	59	55	22	21	39	4
STANISLAUS	330	310	128	49	166	118	109	83	20	18	17	9	8	12	
SUTTER	50	46	17	10	17	15	27	4	4	4	4	1	1	3	
TEHAMA	23	21	13	3	5	8	13		2	2	2	1		2	
TRINITY	10	6	5	2	1	2	4		4	3	3	1	3	1	
TULARE	234	220	109	45	96	85	113	22	14	14	12	1	6	8	
TUOLUMNE	37	29	20	12	13	20	8	1	8	8	8	3	2	5	1
VENTURA	665	607	190	73	332	172	371	64	58	52	47	12	23	29	6
YOLO	287	271	75	14	188	60	173	38	16	12	8	3	7	8	1
YUBA	94	90	21	5	38	8	80	2	4	4	4		1	3	
TOTAL	46010	42452	14819	5784	21909	12030	25762	4660	3558	3234	2908	1121	1009	2138	411

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NUMBER OF INACTIVE NON-FEDERAL PHYSICIANS IN CALIFORNIA

BY COUNTY AND BY SPECIALTY AS OF DECEMBER 1975

SPECIALTY	CD	TOTAL	ALAMEDA	ALPINE	AMADOR	BUTTE	CALAVERAS	COLUSA	CONTRA COSTA	DEL NORTE	EL DORADO	FRESNO	GLENN	HUMBOLDT
AEROSPACE MEDICINE	AM	34	1									2		
ALLERGY	A	10	1									1		
ANESTHESIOLOGY	AN	93	6			1			1			3		
BRONCHO-ESOPHAGOLOGY	BE													
CARDIOVASCULAR DISEASES	CD	43				1			1					
DERMATOLOGY	D	43	4											
DIABETES	DIA	3												
EMERGENCY MEDICINE	EM	7	1											
ENDOCRINOLOGY	END	7	1											
FAMILY PRACTICE	FP	17	1			1			2					
GASTROENTEROLOGY	GE	10	1											
GENERAL PRACTICE	GP	795	48			7	1		81		3	8		8
GEN PREVENTIVE MEDICINE	GPM	15	1											
GERIATRICS	GER	9	2											
GYNECOLOGY	GYN	10	1											
HEMATOLOGY	HEM	4	1			1								
HYPNOSIS	HYP	1												
INFECTIOUS DISEASES	ID	1												
INTERNAL MEDICINE	IM	214	9		1				9			2		1
LARYNGOLOGY	LAR													
LEGAL MEDICINE	LM	2												
NEOPLASTIC DISEASES	ND	1												
NEPHROLOGY	NEP	1												
NEUROLOGY	N	21	2						1			1		
NEUROLOGY-CHILD	CHN	1												
NEUROPATHOLOGY	NP	7												
NUCLEAR MEDICINE	NM	5												
NUTRITION	NTR													
OBSTETRICS	OBS	1												
OBSTETRICS + GYNECOLOGY	OBG	120	9						6			1		
OCCUPATIONAL MEDICINE	OM	69	5			1			2					1
OPHTHALMOLOGY	OPH	109	6						2			3		
OTOLOGY	OT													
OTORHINOLARYNGOLOGY	OTO	83	4						3					
PATHOLOGY	PTH	43	2						1					
PATHOLOGY-CLINICAL	CLP	4												
PATHOLOGY-FORENSIC	FOP	7												
PEDIATRICS	PD	146	6			1			6			2		
PEDIATRICS-ALLERGY	PDA	2												
PEDIATRICS-CARDIOLOGY	PDC	1												
PHARMACOLOGY-CLINICAL	PA	1												
PHYSICAL MED + REHAB	PM	16										1		
PSYCHIATRY	P	107	10						7		2	1		
PSYCHIATRY-CHILD	CHP	6	1											
PSYCHOANALYSIS	PYA	7	1											
PSYCHOSOMATIC MEDICINE	PYM	3												
PUBLIC HEALTH	PH	41	8		1				4			3		
PULMONARY DISEASES	PUD	50	1											
RADIOLOGY	R	64	4			2			3	1				

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NUMBER OF INACTIVE NON-FEDERAL PHYSICIANS IN CALIFORNIA

BY COUNTY AND BY SPECIALTY AS OF DECEMBER 1975

SPECIALTY	CD	TOTAL	ALAMEDA	ALPINE	AMADOR	BUTTE	CALAVERAS	COLUSA	CONTRA COSTA	DEL NORTE	EL DORADO	FRESNO	GLENN	HUMBOLDT
RADIOLOGY,DIAGNOSTIC	DR	29	1						1			2		
RADIOLOGY,PEDIATRIC	PDR													
RADIOLOGY,THERAPEUTIC	TR	4							1					
RHEUMATOLOGY	RHU	2				1								
RHINOLOGY	RHI	1												
SURGERY,ABDOMINAL	ABS	6												
SURGERY,CARDIOVASCULAR	CDS	1												
SURGERY,COLON + RECTAL	CRS	19	2			1			1			1		
SURGERY,GENERAL	GS	182	8						7		1			1
SURGERY,HAND	HS													
SURGERY,HEAD + NECK	HNS													
SURGERY,NEUROLOGICAL	NS	10												
SURGERY,ORTHOPEDIC	ORS	73	6											
SURGERY,PEDIATRIC	PDS	1												
SURGERY,PLASTIC	PS	11							1					
SURGERY,THORACIC	TS	6												
SURGERY,TRAUMATIC	TRS	3												
SURGERY,UROLOGICAL	U	48	4									1		1
OTHER SPECIALTY	OS	760	36			9	1		21	1		6		2
OTHER UNSPECIFIED	US	80	2						8			1		
		3950	140		2	22	2		101	2	6	41		11

NUMBER OF ACTIVE NON-FEDERAL PHYSICIANS IN CALIFORNIA

BY COUNTY AND BY SPECIALTY AS OF DECEMBER 1975

SPECIALTY	CD	TOTAL	IMPERIAL	INYO	KERN	KINGS	LAKE	LASSEN	LOS ANGELES	MADERA	MARIN	MARIPOSA	MENDOCINO	MERCED
AEROSPACE MEDICINE	AM	36			1				13					
ALLERGY	A	257			3				55		1			
ANESTHESIOLOGY	AN	1914	5	2	16	1			678		41	1	3	5
BRONCHO-ESOPHAGOLOGY	BE													
CARDIOVASCULAR DISEASES	CD	791	1		5		1		336		9			
DERMATOLOGY	D	704			3				257		10	1	1	
DIABETES	DIA	18							6					
EMERGENCY MEDICINE	EM	347			6				66	2	27			1
ENDOCRINOLOGY	END	120			1				52		2			
FAMILY PRACTICE	FP	1170	1	1	13	4	1		319	2	7		6	6
GASTROENTEROLOGY	GE	242							90		2		1	
GENERAL PRACTICE	GP	5583	9	5	69	20	11	15	1936	20	60	7	13	29
GEN PREVENTIVE MEDICINE	GPM	103		1	1				32		3			
GERIATRICS	GER	56			1				23		1			
GYNECOLOGY	GYN	119						1	55		2			
HEMATOLOGY	HEM	137							76		2			
HYPNOSIS	HYP	4												
INFECTIOUS DISEASES	ID	69							29		2			1
INTERNAL MEDICINE	IM	5889	5	1	53	3	1	1	2324		105	1	10	5
LARYNGOLOGY	LAR	1							1					
LEGAL MEDICINE	LM	17							4					
NEOPLASTIC DISEASES	ND	101			2				42		2			1
NEPHROLOGY	NEP	116			2				50		1			
NEUROLOGY	N	401			2				174		10			
NEUROLOGY-CHILD	CHN	25							10		1			
NEUROPATHOLOGY	NA	3							3					
NUCLEAR MEDICINE	NM	101							36		3			1
NUTRITION	NTR	8							3					
OBSTETRICS	OBS	9							4		1			
OBSTETRICS + GYNECOLOGY	OBG	2425	6		20	1			924	1	35		5	7
OCCUPATIONAL MEDICINE	OM	259			1				125	1	2			
OPHTHALMOLOGY	OPH	1362	2	1	17	2			469		23		2	4
OTOLOGY	OT	11							6					
OTORHINOLARYNGOLOGY	OTO	690	1		6				239		10		2	2
PATHOLOGY	PTH	1191	2	1	12	2		1	434		16		5	2
PATHOLOGY-CLINICAL	CLP	57							18				2	
PATHOLOGY-FORENSIC	FOP	29			1				14		1			
PEDIATRICS	PD	2668	4		17	2		1	905		57		4	6
PEDIATRICS-ALLERGY	PDA	58							29		1			
PEDIATRICS-CARDIOLOGY	PDC	71							32					
PHARMACOLOGY-CLINICAL	PA	31							7		1			
PHYSICAL MED + REHAB	PM	165			2				65		1			
PSYCHIATRY	P	3262	2	2	16	1		1	1086	2	89		10	4
PSYCHIATRY-CHILD	CHP	381			1			1	146		16			1
PSYCHOANALYSIS	PYA	103							67					
PSYCHOSOMATIC MEDICINE	PYM	11							2					
PUBLIC HEALTH	PH	369	1	1	6	2			108		11		1	3
PULMONARY DISEASES	PUD	285			2				118		2			
RADIOLOGY	R	1306	4	1	18	3	1	1	916		24		8	3

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NUMBER OF ACTIVE NON-FEDERAL PHYSICIANS IN CALIFORNIA

BY COUNTY AND BY SPECIALTY AS OF DECEMBER 1979

SPECIALTY	CD	TOTAL	IM-PERIAL	INYO	KERN	KINGS	LAKE	LASSEN	LOS ANGELES	MADERA	MARIN	MARI-POSA	MENDO-CINO	MERCED
RADIOLOGY,DIAGNOSTIC	DR	536		1	3				155		15			1
RADIOLOGY,PEDIATRIC	PDR	13							5		1			
RADIOLOGY,THERAPEUTIC	TR	183			2				69		2			
RHEUMATOLOGY	RHU	73							36					1
RHINOLOGY	RHI	2							2					
SURGERY,ABDOMINAL	ABS	72			1				32					
SURGERY,CARDIOVASCULAR	CDS	110							48		1			
SURGERY,COLON + RECTAL	CRS	93							47		1			
SURGERY,GENERAL	GS	2941	8	5	41	4		1	1054	3	35	1	11	7
SURGERY,HAND	HS	39							13					
SURGERY,HEAD + NECK	HNS	8							4					
SURGERY,NEUROLOGICAL	NS	368	1		4				148		4			1
SURGERY,ORTHOPEDIC	ORS	1661	2	2	10		2		598		32		1	4
SURGERY,PEDIATRIC	PDS	29							9					
SURGERY,PLASTIC	PS	356			4				127		9			
SURGERY,THORACIC	TS	242			3				102		3			
SURGERY,TRAUMATIC	TRS	12							7					
SURGERY,UROLOGICAL	U	793	3		9		1		288		10		4	
OTHER SPECIALTY	OS	971	1	1	1				309		12		1	1
OTHER UNSPECIFIED	US	1143	1	1	10	1		1	407	1	6		2	2
		42452	90	88	388	46	18	19	15432	32	715	11	91	92

NUMBER OF INACTIVE NON-FEDERAL PHYSICIANS IN CALIFORNIA

BY COUNTY AND BY SPECIALTY AS OF DECEMBER 1975

SPECIALTY	CD	TOTAL	MODOC	MONO	MONTEREY	NAPA	NEVADA	ORANGE	PLACER	PLUMAS	RIVERSIDE	SACRAMENTO	SAN BENITO	SAN BERNARDINO
AEROSPACE MEDICINE	AM	34			1		1	2			3			
ALLERGY	A	18									1			
ANESTHESIOLOGY	AN	93				1	2	13			2	1		2
BRONCHO-ESOPHAGOLOGY	BE													
CARDIOVASCULAR DISEASES	CD	41			2			1	1		3	1		1
DERMATOLOGY	D	43			1	1		1			3	3		1
DIABETES	DIA	3												
EMERGENCY MEDICINE	EM	7						2				1		
ENDOCRINOLOGY	END	7						1						
FAMILY PRACTICE	FP	17									2			
GASTROENTEROLOGY	GE	18			1		1				2	1		
GENERAL PRACTICE	GP	725	1		4	7	1	64	1		29	15		20
GEN PREVENTIVE MEDICINE	GPM	15												1
GERIATRICS	GER	9						3				1		1
GYNECOLOGY	GYN	18						2			2	1		
HEMATOLOGY	HEM	4						1						
HYPNOSIS	HYP	1									1			
INFECTIOUS DISEASES	ID	1												
INTERNAL MEDICINE	IM	210			2			20	3		7	8		9
LARYNGOLOGY	LAR													
LEGAL MEDICINE	LM	2												
NEOPLASTIC DISEASES	ND	1												
NEPHROLOGY	NEP	1												
NEUROLOGY	N	21			1			4			1			
NEUROLOGY-CHILD	CHN	1												
NEUROPATHOLOGY	NA	2												
NUCLEAR MEDICINE	NM	3			1									
NUTRITION	NTR													
OBSTETRICS	OBS	1												
OBSTETRICS + GYNECOLOGY	OBG	126			2	1		7			4	9		3
OCCUPATIONAL MEDICINE	OM	40			1			6			1	2		2
OPHTHALMOLOGY	OPH	109			2	1		12			4	3		3
OTOLOGY	OT													
OTORHINOLARYNGOLOGY	OTO	83			3		2	10			3			2
PATHOLOGY	PTH	43			1			7			3	2		
PATHOLOGY-CLINICAL	CLP	6												
PATHOLOGY-FORENSIC	FOP	7			1									
PEDIATRICS	PD	148			1	1	1	12			3	3		4
PEDIATRICS-ALLERGY	PDA	2												
PEDIATRICS-CARDIOLOGY	PDC	1												
PHARMACOLOGY-CLINICAL	PA	1												
PHYSICAL MED + REHAB	PM	14				1		2			1			1
PSYCHIATRY	P	187			3	6		11	1		4	2		5
PSYCHIATRY-CHILD	CHP	6										1		
PSYCHOANALYSIS	PYA	7						1						
PSYCHOSOMATIC MEDICINE	PYM	3												
PUBLIC HEALTH	PH	91			1	4		11			3	4		1
PULMONARY DISEASES	PUD	50						6			3	1		
RADIOLOGY	R	84			4		1	7				1		

NUMBER OF ACTIVE NON-FEDERAL PHYSICIANS IN CALIFORNIA

BY COUNTY AND BY SPECIALTY AS OF DECEMBER 1975

SPECIALTY	CD	TOTAL	MODOC	MONO	MONTEREY	NAPA	NEVADA	ORANGE	PLACER	PLUMAS	RIVERSIDE	SACRAMENTO	SAN BENITO	SAN BERNARDINO
RADIOLOGY,DIAGNOSTIC	DR	534			8	3		38	1		10	18		15
RADIOLOGY,PEDIATRIC	PDR	13						1						
RADIOLOGY,THERAPEUTIC	TR	183			8			6			3	11		3
RHEUMATOLOGY	RHU	73						4			1			3
RHINOLOGY	RHI	2												
SURGERY,ABDOMINAL	ABS	78				1		7			1	1		1
SURGERY,CARDIOVASCULAR	CDS	119				1		9			1	1		3
SURGERY,COLON + RECTAL	CRS	93			1			8			2	3		
SURGERY,GENERAL	GS	2941			32	16	3	203	6	1	40	90	1	99
SURGERY,HAND	HS	34						1			1	1		3
SURGERY,HEAD + NECK	HNS	8						1						
SURGERY,NEUROLOGICAL	NS	388			9	8		27	2		8	15		9
SURGERY,ORTHOPEDIC	ORS	1061		1	17	7	8	117	6		28	99		48
SURGERY,PEDIATRIC	PDS	29						8				1		1
SURGERY,PLASTIC	PS	356			4		1	27			7	14		9
SURGERY,THORACIC	TS	348			3			17	1		4	18		11
SURGERY,TRAUMATIC	TRS	18						2			1			
SURGERY,UROLOGICAL	U	793			9	3	2	67	1		17	25		26
OTHER SPECIALTY	OS	971			8	1	1	28	2		6	13		13
OTHER UNSPECIFIED	US	1145			3	9	1	44	3		7	39		81
		48482	3	3	384	294	41	2798	126	11	670	1379	14	1068

NUMBER OF INACTIVE NON-FEDERAL PHYSICIANS IN CALIFORNIA

BY COUNTY AND BY SPECIALTY AS OF DECEMBER 1975

SPECIALTY	CD	TOTAL	SONOMA	STANI-SLAUS	SUTTER	TEHAMA	TRINITY	TULARE	TUO-LUMNE	VENTURA	YOLO	YUBA
AEROSPACE MEDICINE	AM	34	1					1				
ALLERGY	A	18								2		
ANESTHESIOLOGY	AN	93	1					1		3		
BRONCHO-ESOPHAGOLOGY	BE											
CARDIOVASCULAR DISEASES	CD	43										
DERMATOLOGY	D	43	1							1		
DIABETES	DIA	3								1		
EMERGENCY MEDICINE	EM	7								1		
ENDOCRINOLOGY	END	7										
FAMILY PRACTICE	FP	17		1							1	
GASTROENTEROLOGY	GE	18		1								
GENERAL PRACTICE	GP	725	17	9	1			6	3	9	6	1
GEN PREVENTIVE MEDICINE	GPM	15		1								
GERIATRICS	GER	9										
GYNECOLOGY	GYN	18						1		1		
HEMATOLOGY	HEM	4										
HYPNOSIS	HYP	1										
INFECTIOUS DISEASES	ID	1										
INTERNAL MEDICINE	IM	218	3	1	1					2		
LARYNGOLOGY	LAR											
LEGAL MEDICINE	LM	2										
NEOPLASTIC DISEASES	ND	1										
NEPHROLOGY	NEP	1										
NEUROLOGY	N	21										
NEUROLOGY-CHILD	CHN	1										
NEUROPATHOLOGY	NP	2										
NUCLEAR MEDICINE	NM	5										
NUTRITION	NTR											
OBSTETRICS	OBS	1	1									
OBSTETRICS + GYNECOLOGY	OBG	128	4		1		1			1	1	
OCCUPATIONAL MEDICINE	OM	69			1					2		
OPHTHALMOLOGY	OPH	109	3							2	1	
OTOLOGY	OT											
OTORHINOLARYNGOLOGY	OTO	63	1	1					1	1		
PATHOLOGY	PTH	43	1									
PATHOLOGY-CLINICAL	CLP	4										
PATHOLOGY-FORENSIC	FOP	7										
PEDIATRICS	PD	146	2	1						1		
PEDIATRICS-ALLERGY	PDA	2										
PEDIATRICS-CARDIOLOGY	PDC	1										
PHARMACOLOGY-CLINICAL	PA	1										
PHYSICAL MED + REHAB	PM	14	3									
PSYCHIATRY	P	167	3					2	1	6		
PSYCHIATRY-CHILD	CHP	8										
PSYCHOANALYSIS	PYA	7										
OMATIC MEDICINE	PYM	5										
TH	PH	91	1	1			1			2	1	
ISEASES	PUD	38								4		
	R	66	3									1

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NUMBER OF INACTIVE NON-FEDERAL PHYSICIANS IN CALIFORNIA

BY COUNTY AND BY SPECIALTY AS OF DECEMBER 1975

SPECIALTY	CD	TOTAL	SONOMA	STANI-SLAUS	SUTTER	TEHAMA	TRINITY	TULARE	TUO-LUMNE	VENTURA	YOLO	YUBA
RADIOLOGY,DIAGNOSTIC	DR	29										
RADIOLOGY,PEDIATRIC	PDR											
RADIOLOGY,THERAPEUTIC	TR	4										
RHEUMATOLOGY	RHU	2										
RHINOLOGY	RHI	1										
SURGERY,ABDOMINAL	ABS	8										
SURGERY,CARDIOVASCULAR	CDS	1										
SURGERY,COLON + RECTAL	CRS	19								1		
SURGERY,GENERAL	GS	182	4	2					1	1	1	
SURGERY,HAND	HS											
SURGERY,HEAD + NECK	HNS											
SURGERY,NEUROLOGICAL	NS	10										
SURGERY,ORTHOPEDIC	ORS	73	1	1				1	1	1		
SURGERY,PEDIATRIC	PDS	1										
SURGERY,PLASTIC	PS	11	1									
SURGERY,THORACIC	TS	6										
SURGERY,TRAUMATIC	TRS	3										
SURGERY,UROLOGICAL	U	48				1						
OTHER SPECIALTY	OS	760	11	8		1	2	8	1	10	8	2
OTHER UNSPECIFIED	US	80	2							1		
		3958	64	20	4	2	4	14	6	58	16	4

NUMBER OF ACTIVE NON-FEDERAL PHYSICIANS IN CALIFORNIA

BY COUNTY AND BY SPECIALTY AS OF DECEMBER 1975

SPECIALTY	CD	TOTAL	SAN DIEGO	SAN FRAN-CISCO	SAN-JOAQUIN	SAN LUIS OBISPO	SAN MATEO	SANTA BARBARA	SANTA CLARA	SANTA CRUZ	SHASTA	SIERRA	SIS-KIYOU	SOLANO
AEROSPACE MEDICINE	AM	34	2	1			4	1	3					
ALLERGY	A	257	27	22	3		6	5	21	2				2
ANESTHESIOLOGY	AN	1914	154	139	15	5	46	30	143	11	12			5
BRONCHO-ESOPHAGOLOGY	BE													
CARDIOVASCULAR DISEASES	CD	791	68	69	6	4	21	8	52	4				2
DERMATOLOGY	D	706	53	64	6	3	33	9	59	3	2			4
DIABETES	DIA	10	1	4										
EMERGENCY MEDICINE	EM	367	22	17	2	1	9	5	10	2	4			2
ENDOCRINOLOGY	END	120	10	21	1		1		4					
FAMILY PRACTICE	FP	1170	73	66	36	11	17	6	48	13	7	1	6	7
GASTROENTEROLOGY	GE	242	20	16	1		14	6	15	1				2
GENERAL PRACTICE	GP	5580	418	109	77	48	63	85	217	53	32	1	12	36
GEN PREVENTIVE MEDICINE	GPM	103	6	9		1	2	2	5	2				
GERIATRICS	GER	56	4	1	2		1	3	1					
GYNECOLOGY	GYN	119	3	5	1		6	7			1			
HEMATOLOGY	HEM	137	21	13				2	13					
HYPNOSIS	HYP	4					1							
INFECTIOUS DISEASES	ID	69	6	3			1		10					
INTERNAL MEDICINE	IM	5460	366	767	36	23	160	67	391	21	18		3	23
LARYNGOLOGY	LAR	1												
LEGAL MEDICINE	LM	12	1	1				1	1					
NEOPLASTIC DISEASES	ND	101	9	3	1		3		9					
NEPHROLOGY	NEP	116	7	13			3		9					
NEUROLOGY	N	491	49	69	1	1	12	6	41	1	1			2
NEUROLOGY-CHILD	CHN	25	3	1			2	1	3					
NEUROPATHOLOGY	NA	3												
NUCLEAR MEDICINE	NM	101	6	10			1	1	9	3	1			
NUTRITION	NTR	8							1					
OBSTETRICS	OBS	9			1			1						
OBSTETRICS + GYNECOLOGY	OBG	2425	170	150	29	10	97	23	176	8	4			10
OCCUPATIONAL MEDICINE	OM	250	7	25	1		6	2	17	2				
OPHTHALMOLOGY	OPH	1362	98	141	13	7	42	24	88	10	5			6
OTOLOGY	OT	11		2			1		1					
OTORHINOLARYNGOLOGY	OTO	689	55	58	6	5	23	9	42	9	2			2
PATHOLOGY	PTH	1181	106	118	11	4	24	11	90	6	6			5
PATHOLOGY-CLINICAL	CLP	97	6	4			2		5					
PATHOLOGY-FORENSIC	FOP	29	1	1				1	2					
PEDIATRICS	PD	2665	171	214	19	6	66	22	208	9	6			13
PEDIATRICS-ALLERGY	PDA	56	8	4					5					
PEDIATRICS-CARDIOLOGY	PDC	71	5	16			1		6					1
PHARMACOLOGY-CLINICAL	PA	31		10			1		9					
PHYSICAL MED + REHAB	PM	165	6	12		1	3	4	15	2	1			2
PSYCHIATRY	P	3260	229	395	30	21	116	30	259	17	6		1	16
PSYCHIATRY-CHILD	CHP	181	29	52	1		17	4	20	2	1			1
PSYCHOANALYSIS	PYA	103	7	11			4		3					
PSYCHOSOMATIC MEDICINE	PYM	11	1	3			1							
PUBLIC HEALTH	PH	309	15	28	3	1	13	10	14	2	1			3
PULMONARY DISEASES	PUD	281	37	33	3		3	2	14					
RADIOLOGY	R	1366	113	77	13	5	38	21	65	6	5		1	5

NUMBER OF ACTIVE NON-FEDERAL PHYSICIANS IN CALIFORNIA

BY COUNTY AND BY SPECIALTY AS OF DECEMBER 1975

SPECIALTY	CD	TOTAL	SAN DIEGO	SAN FRAN-CISCO	SAN-JOAQUIN	SAN LUIS OBISPO	SAN MATEO	SANTA BARBARA	SANTA CLARA	SANTA CRUZ	SHASTA	SIERRA	SIS-KIYOU	SOLANO
RADIOLOGY,DIAGNOSTIC	DR	534	31	78	2	2	21	9	43		1		1	2
RADIOLOGY,PEDIATRIC	PDR	13	2						2					
RADIOLOGY,THERAPEUTIC	TR	163	6	22	1	1	6	2	22	1	1			
RHEUMATOLOGY	RHU	73	6	4				1	11	1				
RHINOLOGY	RHI	2												
SURGERY,ABDOMINAL	ABS	72	5	2	1	1		2	4	1	2		1	2
SURGERY,CARDIOVASCULAR	CDS	110	15	8	1		3	2	16					
SURGERY,COLON + RECTAL	CRS	93	6	10			1	4	4	1	1			
SURGERY,GENERAL	GS	2941	225	250	30	17	73	31	163	16	7		3	14
SURGERY,HAND	HS	39	5	4			2		4					
SURGERY,HEAD + NECK	HNS	8	2	1										
SURGERY,NEUROLOGICAL	NS	390	27	30	3	6	16	4	26	2	2			2
SURGERY,ORTHOPEDIC	ORS	1461	112	140	10	7	44	23	99	10	6			6
SURGERY,PEDIATRIC	PDS	25	3	1					4		1			
SURGERY,PLASTIC	PS	356	30	27	3	2	10	5	34	2	2			
SURGERY,THORACIC	TS	242	15	17	4	1	3	4	14	1	1			
SURGERY,TRAUMATIC	TRS	12					1		1					
SURGERY,UROLOGICAL	U	793	62	58	9	3	20	13	41	4	4			5
OTHER SPECIALTY	OS	871	54	68	2	1	10	9	46	3	3		1	3
OTHER UNSPECIFIED	US	1143	67	100	14	2	13	20	67	4	1			3
		42452	3077	3743	408	190	1100	884	2715	233	136	2	29	161

NON-FEDERAL PHYSICIANS IN CALIFORNIA
BY AGE AS OF DECEMBER 1975

AGE	TOTAL	ACTIVE	INACTIVE
22	1		1
23	11	11	
24	62	62	
25	233	233	
26	872	870	2
27	1063	1061	2
28	1266	1265	1
29	1216	1209	7
30	1149	1140	9
31	1149	1140	9
32	1219	1207	12
33	1226	1217	9
34	1792	1771	21
35	1768	1757	11
36	1745	1736	9
37	1139	1120	19
38	1787	1767	20
39	1798	1783	15
40	1181	1163	18
41	1133	1115	18
42	1030	1016	14
43	1076	1059	17
44	1205	1192	13
45	1144	1129	15
46	1086	1078	8
47	1021	1005	16
48	948	931	17
49	1020	1000	20
50	1157	1136	21
51	1224	1201	23
52	1151	1128	23
53	1103	1073	30
54	1075	1047	28
55	985	958	27
56	827	803	24
57	801	769	32
58	718	694	24
59	796	763	33
60	739	685	54
61	709	665	44
62	690	623	67
63	660	595	65
64	971	909	62
65	561	484	77
66	541	425	116
67	498	375	123
68	455	337	118
69	409	279	130
70	367	249	118
71	385	283	102

NON-FEDERAL PHYSICIANS IN CALIFORNIA
BY AGE AS OF DECEMBER 1975

AGE	TOTAL	ACTIVE	INACTIVE
72	293	166	127
73	283	136	147
74	265	124	141
75	236	107	129
76	217	89	128
77	182	66	116
78	183	55	128
79	157	47	110
80	147	43	104
81	130	26	104
82	129	32	97
83	109	28	81
84	65	9	56
85	74	17	57
86	66	8	58
87	44	10	34
88	42	4	38
89	40	10	30
90	23	1	22
91	31	2	29
92	25	6	19
93	7	1	6
94	14	1	13
95	7		7
96	7		7
97	5		5
98	2		2
100	3	1	2
101	1		1
102	1		1
103	1		1
	46008	42451	3557

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APPENDIX B

1976

ACCREDITED SCHOOL LIST

Pre-Service Programs in Professional Nursing

Baccalaureate Degree

1. Azusa Pacific College
2. Biola College
3. California State College--Bakersfield
4. California State University--Chico
5. California State University--Fresno
6. California State University--Hayward
7. California State University--Long Beach
8. California State University--L.A.
9. California State University--Sacramento
10. Humboldt State University
11. Loma Linda University
12. Mount St. Mary's College
13. Point Loma College
14. San Diego State University
15. San Francisco State University
16. San Jose State University
17. Univ. of California--L.A.
18. Univ. of California--S.F.
19. Univ. of San Francisco

*20. Univ. of San Diego
*21. Holy Names College
*22. Sonoma State College
*23. San Bernadino College
*24. Fullerton College

Diploma Degree

1. California Hospital, School of Nursing
2. Kaiser Foundation School of Nursing
3. Los Angeles County Medical Center, School of Nursing
4. St. Luke's Hospital, School of Nursing
5. Samuel Merritt Hospital, School of Nursing

Associate Degree

1. American River College
2. Antelope Valley College
3. Bakersfield College
4. Cabrillo College
5. Cerritos College
6. Chabot College
7. Chaffey College
8. City College of San Francisco
9. College of the Desert
10. College of Marin
11. College of the Redwoods
12. College of San Mateo
13. College of the Sequoias
14. Compton College
15. Contra Costa College
16. Cuesta College
17. Cypress College
18. De Anza College
19. East Los Angeles College
20. El Camino College
21. Evergreen Valley College
22. Fresno City College
23. Golden West College
24. Grossmont College
25. Hartnell College
26. Imperial Valley College
27. Loma Linda University
28. Long Beach City College
29. Los Angeles City College
30. Los Angeles Harbor College

*These programs require that entering students already possess a R.N. degree.

Associate Degree—(continued)

31. Los Angeles Pierce College
32. Los Angeles Southwest College
33. Los Angeles Trade-Technical College
34. Los Angeles Valley College
35. Los Medanos College
36. Merritt College
37. Modesto Junior College
38. Mount St Mary's College
39. Mount San Antonio College
40. Napa College
41. Ohlone College
42. Pacific Union College
43. Palomar College
44. Pasadena City College
45. Rio Hondo College
46. Riverside City College
47. Sacramento City College
48. Saddleback College
49. San Bernardino Valley College
50. San Diego City College
51. San Joaquin Delta College
52. Santa Ana College
53. Santa Barbara City College
54. Santa Monical College
55. Santa Rosa Junior College
56. Shasta College
57. Solano Community College
58. Southwestern College
59. Ventura College
60. Victor Valley College

Graduate Programs

Masters Degree

1. California State Univ.—Long Beach
2. California State Univ.—Los Angeles
3. California State Univ.—Sacramento
4. California State Univ.—Fresno
5. California State Univ.—Chico
6. San Jose State University
7. University of California—L.A.
8. University of California—S.F.
9. Loma Linda University

Doctoral Degree

1. University of California—S.F.

SOURCE: Board of Registered Nursing, American Nurses' Association.

CALIFORNIA ACCREDITED VOCATIONAL NURSING PROGRAMS, NUMBER OF GRADUATES, 1975

Allen Hancock College, Santa Maria	23
American Vocational School, Los Angeles	165
Bakersfield College, Bakersfield	33
Berkley School of Nursing Arts, Santa Monica	59
Butte Jr. College District, Durham	24
Center for Health Studies, San Francisco	14
Casa Loma Institute of Technology, Pacoima	10
Cerritos College, Norwalk	46
Chaffey College, Alta Loma	24
Citrus College, Azusa	44
College of Allied Health Careers, Los Angeles	7
College of Calif. Medical Affiliates, San Francisco	46
College of the Canyons, Valencia	16
College of the Desert, Palm Desert	21
College of the Marin, Kentfield	13
College of the Redwoods, Eureka	27
College of San Mateo, San Mateo	33
College of the Siskiyous, Weed	14
Compton College, Compton	25
Cuesta College, San Luis Obispo	12
Cypress College, Cypress	50
De Anza College, Cupertino	16
East Bay Skills Center, Oakland	41
East Los Angeles College, Los Angeles	20
Eden Area Vocational School, San Lorenzo	38
El Camino College, Torrance	37
Fresno City College, Fresno	39
Galileo Community Education Center, San Francisco	35
Gavilan College, Gilroy	1
Glendale College, Glendale	43
Grossmont School District, La Mesa	77
Golden West College, Huntington Beach	67
Gartnell College, Salinas	1
Hayward Adult School, Hayward	50
Kaiser Foundation Hospital, Fontana	13
Laney College, Oakland	39
La Sierra Academy, Riverside	11
Letterman General Hospital, SF	25
Livermore Valley Adult School, Livermore	13
Loma Linda University Hospital, Loma Linda	27
Long Beach City College, Long Beach	56
Los Angeles City Adult School, LA	95
Los Angeles City Adult School MDTA, LA	76
Los Angeles County-USC Medical Center, LA	38
Los Angeles Harbor College, Wilmington	39
Los Angeles Trade-Technical College, LA	65
Los Angeles Valley College, Van Nuys	29
Los Medanos College, Pittsburg	36
Merced College, Merced	21
Mira Costa College, Oceanside	22
Modesto Junior College, Modesto	73
Mt. San Antonio College, Walnut	51
Napa College, Napa	25
Neumiller Hospital School of Vocational Nursing, San Quentin	4
Pasadena City College, Pasadena	40
Pittsburg Adult Ed. Vocational Nursing Program, Pittsburg	20
Porterville College, Porterville	20
Rancho Arroyo School, Sacramento	16
Rio Hondo Junior College, Whittier	58
Rincon Inter-Comm. School of Vocational Nursing, Frontera	13
Riverside College, Riverside	29
	85
San Bernardino Valley College, San Bernardino	20
San Diego City College, San Diego	40
San Diego Mesa College, San Diego	49

SOURCE: Board of Vocational Nurse and Psychiatric Technician Examiners.

1975 PROGRAMS--LVN GRADUATES (continued)

San Francisco Skills Center, San Francisco	19
San Joaquin Delta College, Stockton	37
Santa Ana College, Santa Ana	65
Santa Barbara City College, Santa Barbara	25
Santa Monica City College, Santa Monica	20
Sierra College, Rocklin	26
Silas B. Hays Army Hospital, Fort Ord	17
Simi Valley Adult School, Simi	41
Solano Community College, Suisun	11
Southwestern College	36
Ukiah Adult School, Ukiah	25
United Health Careers Institute, San Bernardino	12
Valley College of Medical Dental Assistants, North Hollywood	44
Ventura College, Ventura	27
Vocational Nursing School of California, LA	214
West Valley College, Saratoga	56
Yuba College, Marysville	47
YWCA Job Corps, LA	23
TOTAL	3,064

NURSING DEGREES CONFERRED (BACHELOR'S AND MASTER'S) BY THE CALIFORNIA STATE UNIVERSITY AND COLLEGES

1972-1975

	Year	M - F	BAK	CHI	D H	FRE	FUL	HAY	HUM	L B	L A	NOR	POM	SAC	S B	S D	S F	S J	SLO	SON	STA	TOTAL
B.S.	71-72	M		3		6			1	1	7			1		4	2	5				30
		F		58		89			13	60	132			48		101	79	92				672
	72-73	M		4		14		1	1	2	6			1		3	4	6				42
		F		66		115		19	20	72	140			46		81	53	113				725
	73-74	M	3	3		13		5	0	1	23			4		3	1	8		7		71
		F	59	86		92		50	22	71	210			72		76	55	122		30		945
	74-75	M	4	4		12		0	3	2	13			4		6	4	9		3		64
		F	34	88		116		87	36	81	165			55		78	76	105		53		974
	Total		100	312		457		162	96	290	696			231		352	274	460		93		3523
M.S.	71-72	M		0		3					0							2				5
		F		1		13					24							12				50
	72-73	M		1		5					1							0				7
		F		3		7					39							9				58
	73-74	M		0		3					1							0				4
		F		8		15					45							12				80
	74-75	M		2		2					1							0				5
		F		4		12					28							15				59
	Total			19		60					139							50				268

Source: Division of Institutional Research, Office of the Chancellor, the California State University and Colleges, Los Angeles, California.

Key:
BAK - Bakersfield
CHI - Chico
D H - Dominguez Hills
FRE - Fresno
FUL - Fullerton
HAY - Hayward
HUM - Humboldt
L B - Long Beach
L A - Los Angeles
NOR - Northridge
POM - California Polytechnic University, Pomona
SAC - Sacramento
S B - San Bernardino
S D - San Diego
S F - San Francisco
S J - San Jose
SLO - California Poly. Univ., San Luis Obispo
SON - Sonoma
STA - Stanislaus

NURSING DEGREES CONFERRED

University of California, 1965-66 through 1973-74

	Los Angeles		San Francisco	
	Masters	Doctorates	Masters	Doctorates
1965-66	48	--	91	--
1966-67	46	--	102	--
1967-68	34	--	111	--
1968-69	29	--	137	1
1969-70	67	--	127	2
1970-71	61	--	149	1
1971-72	62	--	137	5
1972-73	76	--	159	6
1973-74	98	--	*116	4

SOURCE: Offices of the Deans of the Schools of Nursing.

*Drop from previous year is due to an administrative decision to change the degree award date.

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APPENDIX C

AGE DISTRIBUTION OF 1974 DENTAL GRADUATES IN CALIFORNIA

Age	Number of Graduates
22	17
25	4
26	31
27	120
28	166
29	73
30	44
31	22
32	18
33	19
34	13
35	11
36	9
37	2
38	3
39	1
40	3
41	4
43	3
44	2
45	2
*NR	2
TOTAL	569

SOURCE: American Dental Association

1973 ACTIVE DENTISTS IN CALIFORNIA BY STATE OF GRADUATION

State of Graduation	Number of Dentists
Alabama	12
California	9,495
Colorado	25
District of Columbia	257
Florida	1
Georgia	39
Illinois	1,127
Indiana	105
Iowa	173
Kentucky	61
Louisiana	31
Massachusetts	106
Maryland	105
Michigan	246
Minnesota	278
Missouri	621
Nebraska	363
North Carolina	5
New Jersey	43
New York	274
Ohio	378
Oregon	366
Pennsylvania	403
South Carolina	3
Tennessee	132
Texas	91
Virginia	30
Washington	118
Wisconsin	258
All States, Total	15,146
Foreign	212
TOTAL	15,358

SOURCE: American Dental Association

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AGE DISTRIBUTION OF 1975 ACTIVE DENTISTS IN CALIFORNIA

Age	Number of Dentists	Age	Number of Dentists
24	20	51	336
25	139	52	339
26	286	53	357
27	332	54	329
28	435	55	279
29	442	56	248
30	424	57	211
31	471	58	223
32	503	59	195
33	365	60	167
34	396	61	162
35	337	62	146
36	362	63	123
37	372	64	131
38	366	65	129
39	310	66	118
40	339	67	135
41	381	68	139
42	371	69	132
43	358	70	141
44	344	71	143
45	272	72	127
46	243	73	132
47	264	74	121
48	300	75	108
49	264	Over 75	870
50	300	NR*	574
		Total	15358

1975, ACTIVE DENTISTS IN CALIFORNIA BY YEAR AND BY SCHOOL OF GRADUATION

Year of Graduation	U.C.L.A.	U.C.—S.F.	University of So. Calif.	Loma Linda	University of the Pacific	State Total	Other U.S.	Foreign	Total
1975	91	70	101	95	85	442	156	-	598
1974	78	59	101	36	137	411	157	1	569
1973	75	53	99	38	76	341	118	-	459
1972	73	59	97	24	74	327	134	2	463
1971	75	61	95	33	67	331	176	4	511
1970	61	60	97	43	49	310	197	3	510
1969	21	60	89	40	51	261	204	8	473
1968	20	61	92	31	53	257	183	12	452
1967		59	75	39	47	220	198	9	427
1966		60	81	23	34	198	183	13	394
1965		64	82	26	54	226	193	10	429
1964		64	85	32	46	227	208	10	445
1963		68	87	32	41	228	180	8	416
1962		97	84	36		217	204	12	433
1961		106	91	32		229	158	7	394
1960		113	81	28		222	150	6	378
1959		104	92	27		223	149	3	375
1958		97	88	30		215	158	11	384
1957		96	90	24		210	131	9	350
1956		83	92			175	168	4	347
1955		91	96			187	141	2	330
1954		100	89			189	135	12	336
1953		97	88			185	104	8	297
1952		92	72			164	99	8	271
1951		86	92			178	98	6	282
1950		77	82			159	76	4	239
1949		54	48			102	52	6	160
1948		38	39			78	90	7	175
1947		60	73			133	106	2	241
1946		68	58			126	92	2	220
1945		93	89			182	101	2	285
1944		99	75			174	87	3	264
1943		79	117			196	79	3	278
1942		52	31			83	56	1	140
1941		41	48			89	36	1	126
1940		54	40			94	48	-	142
pre-1940		1,035	870			1,906	846	13	2,765
Total	494	3,710	3,806	669	816	9,495	5,651	212	15,358

Source: American Dental Association, Chicago, Illinois, December 1975.

APPENDIX D

APPENDIX D

Methodology and Base Case for Physician Supply Projections and Migration Analysis

Basic Projection Methodology

In this appendix the approach used for projecting the number of active physicians in California consists of two steps. In the first step, the total future number of physicians is estimated. In the second, the proportion of these physicians actively employed is calculated. The methodology used for accomplishing the first step involves three tasks. First, losses in the current supply of physicians due to attrition from death are calculated. Second, net additions to the supply from the expected flow of in-migrating physicians trained outside the state are estimated. Third, net additions to this supply from the expected flow of new graduates from California medical schools are projected. In estimating additions to the supply, a distinction is made between residents and interns and other physicians. A further distinction is made between physicians trained in the state and physicians trained outside the state—i.e., those who are graduates of U.S. medical schools and those who attended foreign medical schools.

Using this methodology to project the future number of physicians implies a model reflecting fundamental age-related changes in the career patterns of physicians. This model can be expressed symbolically as:

$$\mathrm{TMD}(t) = \sum_{i} \mathrm{TMD}(i,t) \tag{D-1}$$

$$\mathrm{AMD}(t) = \sum_{i} \mathrm{AOA}(i,t)+\mathrm{RI}(i,t) \tag{D-2}$$

$$\mathrm{TMD}(i,t) = \mathrm{OA}(i,t)+\mathrm{RI}(i,t) \tag{D-3}$$

$$\mathrm{AOA}(i,t) = \mathrm{OA}(i,t)P(A|R,i) \tag{D-4}$$

$$\mathrm{OA}(i,t) = \mathrm{OAC}(i,t)+\mathrm{OAU}(i,t)+\mathrm{OAF}(i,t) \tag{D-5}$$

$$\mathrm{RI}(i,t) = \mathrm{RIC}(i,t)+\mathrm{RIU}(i,t)+\mathrm{RIF}(i,t) \tag{D-6}$$

$$\mathrm{OAC}(i,t) = \mathrm{OAC}(i-1,t-1)(1-d(i-1))+\mathrm{NOAC}(i-1,t-1) \tag{D-7}$$

$$\mathrm{OAU}(i,t) = \mathrm{OAU}(i-1,t-1)(1-d(i-1))+\mathrm{NOAU}(i-1,t-1) \tag{D-8}$$

$$\mathrm{OAF}(i,t) = \mathrm{OAF}(i-1,t-1)(1-d(i-1))+\mathrm{NOAF}(i-1,t-1) \tag{D-9}$$

$$\mathrm{RIC}(i,t) = \mathrm{RIC}(i-1,t-1)(1-d(i-1))+\mathrm{NRIC}(i-1,t-1) \tag{D-10}$$

$$\mathrm{RIU}(i,t) = \mathrm{RIU}(i-1,t-1)(1-d(i-1))+\mathrm{NRIU}(i-1,t-1) \qquad \text{(D-10)}$$

$$\mathrm{RIF}(i,t) = \mathrm{ROF}(i-1,t-1)(1-d(i-1))+\mathrm{NRIF}(i-1,t-1) \qquad \text{(D-11)}$$

$$\mathrm{NOAC}(i-1,t-1) = \sum_{m=1}^{10} \mathrm{CCO}(m)B(i-m)\mathrm{GC}(t-m-1) \qquad \text{(D-12)}$$

$$\mathrm{NOAU}(i-1,t-1) = \sum_{m=1}^{11} \mathrm{CUO}(m)B(i-m)\mathrm{GU}(t-m-1) \qquad \text{(D-14)}$$

$$\mathrm{NOAF}(i-1,t-1) = \mathrm{FO}\cdot\mathrm{NOAU}(i-1,t-1) \qquad \text{(D-15)}$$

$$\mathrm{NRIC}(i-1,t-1) = \sum_{m=1}^{10} \mathrm{CCR}(m)B(i-m)\mathrm{GC}(t-m-1) \qquad \text{(D-16)}$$

$$\mathrm{NRIU}(i-1,t-1) = \sum_{m=1}^{11} \mathrm{CUR}(m)B(i-m)\mathrm{GU}(t-m-1) \qquad \text{(D-17)}$$

$$\mathrm{NRIF}(i-1,t-1) = \mathrm{FR}\cdot\mathrm{NRIU}(i-1,t-1) \qquad \text{(D-18)}$$

TMD(t) = the number of physicians licensed and living in California in time period t.

AMD(t) = the number of active licensed physicians living in California in time period t.

P(A|R,i) = the conditional probability that a physician will be active, given that he or she is licensed and living in the state and i years old (Table D-9).

TMD(i,t) = the number of physicians of age i licensed and living in California in time period t (Table D-3).

AOA(i,t) = the number of active other physicians (nonresident and nonintern) of age i licensed and living in California in time period t.

OA(i,t) = the number of other (nonresident and nonintern) physicians of age i licensed and living in California in time period t (Table D-3).

RI(i,t) = the number of residents and interns of age i living and licensed in California in time period t (Table D-3).

OAC(i,t) = the number of other (nonresident and nonintern) physicians of age i who graduated from California medical schools and are licensed and living in California in time period t.

OAU(i,t) = the number of other (nonresident and nonintern) physicians of age i who graduated from U.S. medical schools and are licensed and living in California in time period t.

OAF(i,t) = the number of other (nonresident and nonintern) physicians of age i who graduated from foreign medical schools and are licensed and living in California in time period t.

OAC(i-1,t-1) = the number of other (nonresident and non-intern) physicians of age (i-1) who graduated from California medical schools, who are licensed and living in California in time period (t-1), and who were also practicing in California in time period (t-1).

OAU(i-1,t-1) = number of other (nonresident and non-intern) physicians of age (i-1) who graduated from U.S. medical schools, who are licensed and living in California in time period (t-1), and who were also practicing in California in time period (t-1).

OAF(i-1,t-1) = number of other (nonresident and non-intern) physicians of age (i-1) who graduated from foreign medical schools, who are licensed and living in California in time period (t-1), and who were also practicing in California in time period (t-1).

NOAC(i-1,t-1) = number of other (nonresident and non-intern) physicians of age (i-1) who graduated from California medical schools and who first took up practice in California in time period (t-1).

NOAU(i-1,t-1) = number of other (nonresident and non-intern) physicians of age (i-1) who graduated from U.S. medical schools and who first took up practice in California in time period (t-1).

NOAF(i-1,t-1) = number of other (nonresident and non-intern) physicians of age (i-1) who graduated from foreign medical schools and who first took up practice in California in time period (t-1).

RIC(i,t) = the number of resident and intern physicians of age i who graduated from California medical schools and who are licensed and living in California in time period t.

RIU(i,t) = the number of resident and intern physicians of age i who graduated from U.S. medical schools and who are licensed and living in California in time period t.

RIF(i,t) = the number of resident and intern physicians of age i who graduated from foreign medical schools and who are licensed and living in California in time period t.

RIC(i-1,t-1) = the number of resident and intern physicians of age (i-1) who graduated from California medical schools, who are licensed and living in California in time period (t-1), and who were also practicing in California in time period (t-1).

RIU(i-1,t-1) = the number of resident and intern physicians of age (i-1) who graduated from U.S. medical schools, who are licensed and living in California in time period (t-1), and who were also practicing in California in time period (t-1).

RIF(i-1,t-1) = the number of resident and intern physicians of age (i-1) who graduated from foreign medical schools, who are licensed and living in California in time period (t-1), and who were also practicing in California in time period (t-1).

NRIC(i-1,t-1) = the number of resident and intern physicians of age (i-1) who graduated from California medical schools and who first took up practice in California in time period (t-1).

NRIU(i-1,t-1) = the number of resident and intern physicians of age (i-1) who graduated from U.S. medical schools and who first took up practice in California in time period (t-1).

NRIF(i-1,t-1) = the number of resident and intern physicians of age (i-1) who graduated from foreign medical schools and who first took up practice in California in time period (t-1).

CCO(m) = the fraction of graduates of California medical schools who take up other (nonresident and non-intern) practice in California m years after graduation (Table D-5).

CUO(m) = the fraction of graduates of U.S. medical schools who take up practice in California m years after graduation (Table D-4).

CCR(m) = the fraction of graduates of California medical schools who take up practice in California as residents or interns m years after graduation (Table D-5).

CUR(m) = the fraction of graduates of U.S. medical schools who take up practice in California as residents and interns m years after graduation (Table D-4).

FO = a factor expressing the number of foreign medical school graduates who take up practice in California as other (nonresident and non-intern) physicians for the first time in time period (t-1) as a fraction of U.S. graduates who take up such practice in California for the first time in time period (t-1).

FR = a factor expressing the number of foreign medical school graduates who take up practice in California as resident and intern physicians for the first time in time period (t-1) as a fraction of U.S. graduates who take up such practice in California for the first time in time period (t-1).

B(i-m) = the fraction of each graduating class that is i years old m years after graduation.

GC(t-m-1) = the number of California medical school graduates in year (t-m-1) (Table D-8).

GU(t-m-1) = the number of U.S. medical school graduates in year (t-m-1).

m = the number of years since graduation (Table D-6).

$d(i-1)$ = the probability of death for physicians of age $(i-1)$ in a given time period.

The Estimated Existing Supply

The current supply of licensed physicians in the state of California is composed of residents and interns and those who are in practice outside of such programs. Since there are many possible professional settings, all physicians not enrolled in residency or internship programs are referred to in this report as other physicians. Each of these two groups are comprised of physicians trained in California, those trained in the United States but outside California, and those trained outside the United States, commonly referred to as foreign medical graduates (FMGs). The cross-tabulation of the estimated number of 1975 California physicians by each of these categories is shown in Table D-1.

Table D-1. Cross-Tabulation of Estimated 1975 California Physician Supply*

	Total Licensed	Residents and Interns	Other Active Physicians
California graduates	13,147	2,050	10,104
Other U.S. graduates	27,967	4,141	21,693
Foreign medical graduates	5,050	637	4,018
Total	46,165	6,829	35,816

*December 1975

The data in Table D-1 were derived from the California state board of licensing and the American Medical Association (AMA) master computer tapes of physicians, with the total number of physicians being taken from the board figures and the distribution by age and category being taken from the AMA tapes. As of December 1975 the state licensing board reports 46,165 total licensed physicians. INTERPLAN estimates that all of these were non-federal physicians, and that 42,646 were active non-federal. This coincides very well with the AMA tape estimate of 42,452 active non-federal physicians in California at year end 1975.

The figures in Table D-1 show that over 70 percent of the 1975 California physician supply received their degrees outside either the state or the nation. Further, residents and interns comprise almost 15 percent of the total. These percentages are summarized in Table D-2.

Table D-2. Percentage Distribution of Estimated 1975 California Physician Supply

	Total	Residents and Interns	Other Physicians
California graduates	28.5	4.4	24.1
Other U.S. graduates	60.6	9.0	51.6
Foreign medical graduates	10.9	1.4	9.5
	100.0	14.8	85.2

Using the methodology described in this appendix, the age distribution of the current physician supply is another aspect of the composition of the existing physician inventory that is important for projecting supply. These age distributions are summarized in Table D-3, together with the survival probability for each age group (see equations D-7 to D-11 and the accompanying definitions). The age distribution of residents and interns was estimated from the age distribution of medical school graduates (see Table D-7) by assuming that, on the average, a graduate was two years older when he was a resident. The age distribution of the other physicians was then calculated by subtracting the number of residents and interns in each age group from the total number of physicians in that same age group.

Migration Rates

The migration rates are that proportion of other U.S. graduates entering the state and that of California graduates leaving the state. In estimating these migration rates, it is assumed that they are a function of the number of years since graduation. In the years immediately following graduation, new

Table D-3. Estimated Age Distribution of 1975 Supply of Licensed Physicians and Probability of Surviving

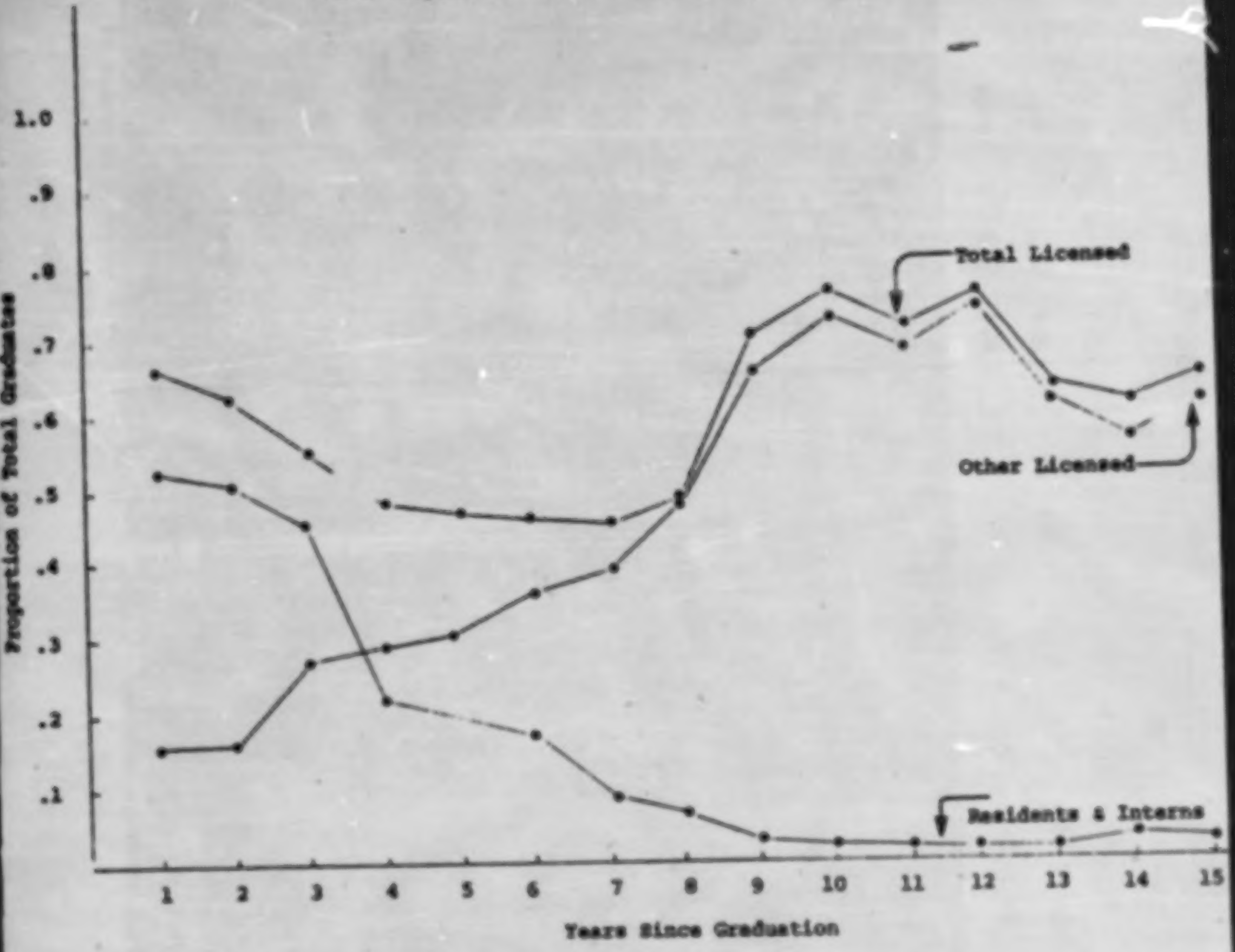
Age	Total TMD(i,t) Number	%	Residents and Interns RI(i,t) Number	%	Other Physicians OA(i,t) Number	%	Probability of Surviving (1-d(i))
Under 25	92	.2	61	.9	39	.1	.9980
25 to 29	5,170	11.2	4,849	71.2	315	.8	.9982
30 to 34	6,233	13.5	1,393	20.4	4,839	12.3	.9981
35 to 39	5,817	12.6	321	4.7	5,468	13.9	.9976
40 to 44	6,093	13.2	109	1.6	6,018	15.3	.9959
45 to 49	5,632	12.2	48	.7	5,586	14.2	.9933
50 to 54	6,048	13.1	27	.4	6,058	15.4	.9891
55 to 59	4,293	9.3	14	.2	4,248	10.8	.9825
60 to 64	3,232	7.0	7	.1	3,226	8.2	.9733
65 to 69	1,985	4.3	0	0	1,966	5.0	.9602
70+	1,570	3.4	0	0	1,573	4.0	.9184
Total	46,165	100%	6,829	100%	39,336	100%	

graduates complete internships and residencies and eventually settle in a relatively permanent location to continue their practice. The observed patterns for California physicians, as described below, indicate that California medical school graduates who remain in the state for their internship and residency tend to locate in the state permanently.

In-Migration - United States Graduates

California has a relatively high dependence on physicians trained outside the state, as illustrated in Table D-2. Figure D-1 shows the pattern of in-migration for residents and interns as well as other physicians as a function of years since graduation. These data show a smooth progression of

Figure D-1. Graduates of California Medical Schools Practicing in California as a Proportion of Total Graduates



increase in the proportion of U.S. graduates taking up practice as "other physicians", starting at 0.6 percent one year after graduation and leveling off at 8.8 percent ten years later.

In contrast, the proportion who come to California as residents and interns start at 6.7 percent after the first year and decrease to about 0.5 percent ten years later. The net result is a fairly smooth progression of the proportion of total non-California, United States medical school graduates in-migrating to California; starting at 7.3 percent one year after graduation and going to 9.2 percent ten years later.

From the trends shown in Figure D-1, the fration of graduates of U.S. schools who take up practice in California m years after graduation, either as residents or interns (CUR(m)) or as other physicians (CUD(m)) can be calculated. These factors, which are used in equations D-17 and D-14 for the base case projection of future physician supply, are shown in Table D-4.

Table D-4. Fraction of U.S. Graduates Taking up Practice in California m Years After Graduation—Base Case*

Years Since Graduation	Residents and Interns	Other Physicians
1	+.0667	+.0061
2	-.0076	+.0113
3	-.0098	+.0021
4	-.0135	+.0115
5	-.0035	+.0102
6	-.0068	+.0133
7	-.0082	+.0121
8	-.0045	+.0001
9	-.0052	+.0063
10	-.0021	+.0005
11	-.0009	+.0146

*Source: AMA Master Physician Tapes.

The observed pattern of out-migration for the California graduates mirrors that pattern seen for the in-migration of the U.S. graduates. The proportion of California medical school graduates who perform their residencies and internships in the state starts at about 53 percent one year after graduation, gradually decreasing over the following ten years to about four percent. The proportion who take up practice in the state as other physicians start at about 13 percent one year after graduation and increases to 66 percent ten years later. The total proportion who stay in the state after the completion of residencies and internships is about 70 percent, and, conversely, about 30 percent of California medical school graduates migrate out of the state. These patterns are shown in Figure D-2.

Using the migration trend patterns for California medical school graduates shown in Figure D-2, the fraction of graduates of California schools who take up practice in California m years after graduation, either as residents or interns (CCR(m)) or as other physicians (CCO(m)), can be calculated. These factors, which are used in equations D-13 and D-16, are shown in Table D-5.

Projecting In-Migration of U.S. Graduates—Base Case

Future in-migration of non-California, U.S. graduates can be projected by using the migration rates and the estimated total number of U.S. graduates between 1976 and 1990 (see Table D-6). The estimated age distribution of these physicians migrating to the state is based on the age distribution of medical school graduates (Table D-7), as shown in equations D-14 and D-17.

Projecting In-Migration of Foreign Medical Graduates—Base Case

In 1975, foreign medical graduates (FMGs) in the state equalled 30.9 percent of the number of U.S. trained physicians who in-migrated to the state. For the base case, it is assumed that the future trend of FMSg in California will be the same as that for the nation as a whole, as estimated in reference 4.

Figure D-2. Graduates of United States, Non-California Medical Schools Practicing in California as a Proportion of Total Graduates

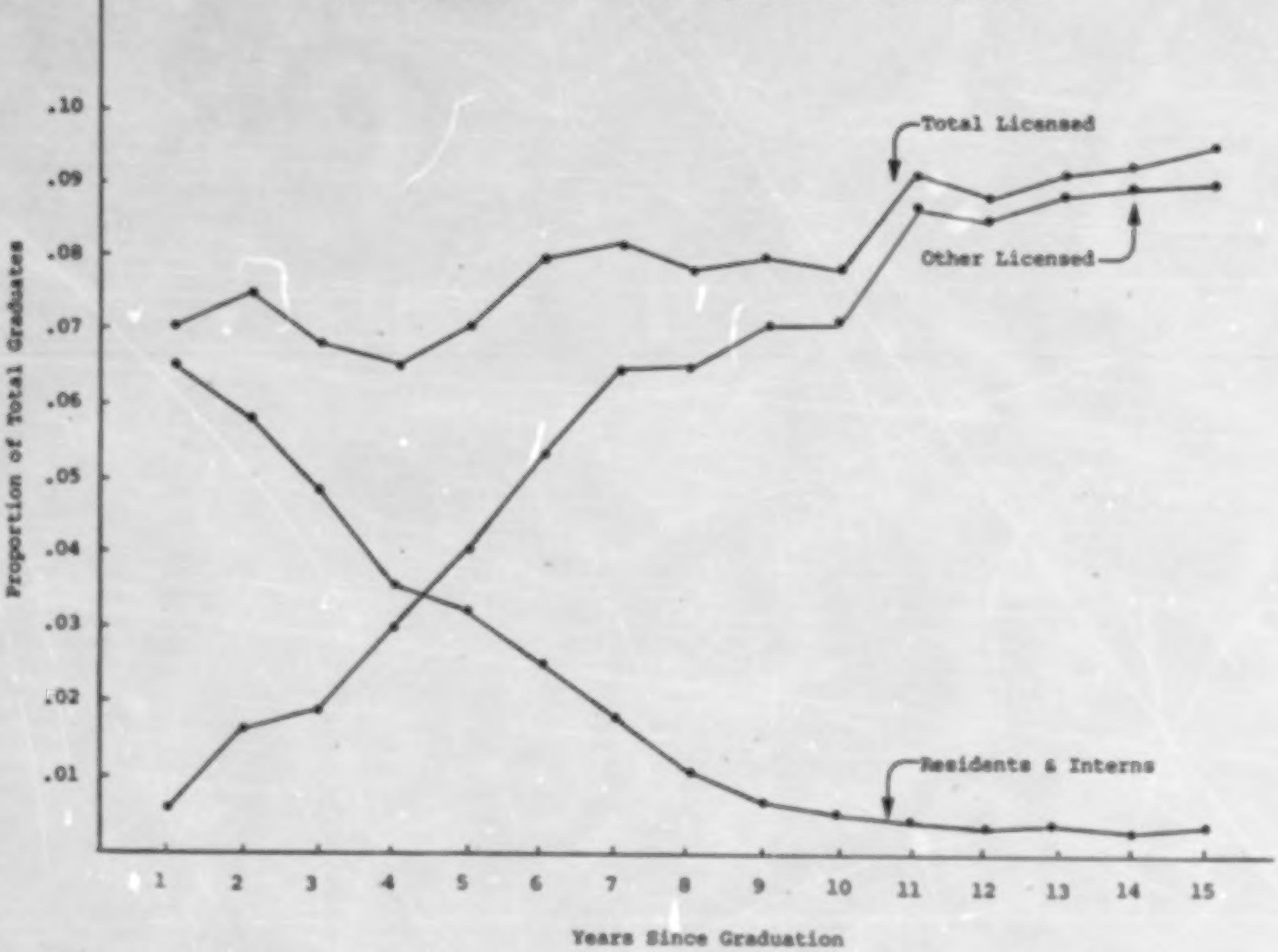


Table D-5. Fraction of California Graduates Taking up Practice in California m Years After Graduation—Base Case*

Years Since Graduation	Residents and Interns	Other Physicians
1	+.527	+.126
2	-.023	+.035
3	-.048	+.010
4	-.168	+.100
5	-.101	+.028
6	-.019	+.010
7	-.078	+.061
8	-.026	+.021
9	-.041	+.082
10	+.022	+.183

Table D-6. Estimated U.S. Graduates*

Year	Number
1976	12,680
1977	13,123
1978	13,579
1979	13,760
1980	13,944
1981	14,130
1982	14,319
1983	14,509
1984	14,703
1985	14,899
1986	15,098
1987	15,299
1988	15,503
1989	15,710
1990	15,920

*Source: Reference 4.

Table D-7. Age Distribution of Medical School Graduates

Age	Percent
Under 25	13.7
25 to 29	70.0
30 to 34	11.0
35 to 39	2.9
40 to 44	1.1
45 to 49	.6
50 to 54	.4
55+	.3
	100.0

*Source: AMA Physician Tapes.

In reference 4, it is estimated that between 1976 and 1990, FMGs as a proportion of total MDs in the nation will increase by 30 percent, going from 30.9 in 1975 to 40.3 in 1990. Thus, the proportion of FMGs as a fraction of total U.S. graduate physicians in the state is estimated to increase at an annual rate of growth of .020 percent, compounded.

California Graduates

To estimate the number of California graduates between 1976 and 1990, it is assumed that the rate of growth in the number of these graduates is the same as that for the nation as a whole, as estimated in reference 4. The annual rate of growth, F(t), for each five year period calculated from the data in Table D-6 is as follows: 1976-80 = .024, 1981-85 = .0133, and 1986-90 = .0133. Table D-8 shows the estimated number of California graduates for the base case, using these assumed rates of growth according to equation D-19.

$$GC(t) = GC(t-1) \cdot F(t) \qquad \text{(D-19)}$$

Tabel D-8. California Graduates, Base Case Projection—1976 to 1990

Year	Graduates
1976	788
1977	807
1978	826
1979	846
1980	866
1981	877
1982	889
1983	901
1984	912
1985	925
1986	937
1987	949
1988	962
1989	975
1990	988

Base Case Projection of Active Physicians

The total number of physicians licensed and living in California in future years can be estimated by using the existing supply as a point of departure, applying attrition rates and estimating additions from California graduates, U.S. graduates and FMGs. The final step in projecting the number who will be active is to apply the probability that a physician of age i will also be active. The value for this conditional probability. $P(A|R,i)$, estimated from reference 16, are shown in Table D-9.

Table D-9. Conditional Probability That a Licensed California Physician in Age Group i is Active

Age	$P(A\|R,i)$
Under 25	1.0
25 to 29	.996
30 to 34	.975
35 to 39	.994
40 to 44	.992
45 to 49	.989
50 to 54	.985
55 to 59	.969
60 to 64	.923
65 to 69	.838
70 to 74	.781
75+	.607

The resultant estimated number of active physicians in California in 1975, 1980, 1985 and 1990 is shown in Table D-10. This table also shows the breakdown of these estimates according to California, U.S., and foreign medical graduates and according to status as residents and interns or other physicians. These estimates of the future number of active physicians in California are analyzed and evaluated in the section on physicians in the body of this report.

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Table D-10. Base Case Estimated Total Licensed and Active Physicians in California

	1975		1980		1985		1990	
	Number	%	Number	%	Number	%	Number	%
Total Licensed Physicians	46,165		54,732		4,447		74,772	
Active Physicians	42,646	100.0	50,302	100.0	59,356	100.0	68,691	100.0
California Graduates	12,154		14,319		16,770		19,342	
Residents and Interns	2,054	28.5	2,509	28.3	2,832	28.3	3,129	28.1
Other Physicians	10,104		11,810		13,948		16,213	
U.S. Graduates	25,834	60.6	30,588	60.6	35,890	60.5	41,372	60.2
Residents and Interns	4,141		5,252		5,950		6,499	
Other Physicians	21,693		25,336		29.940		34,873	
Foreign Medical Graduates	4,655	10.9	5,562	11.1	6,683	11.2	7,976	11.7
Residents and Interns	637		818		944		1,054	
Other Physicians	4,018		4,744		5,739		6,922	
Total Residents and Interns	6,829		8,381		9,727		10,682	
Total Active Other Physicians	35,816		41,921		49,628		58,009	
California Population (thousands)	21,206		22,6[illegible]9		24,363		26,098	
Active Physicians per 100,000	201		222		243		263	

APPENDIX D

Sensitivity Analysis of Future California Physician Supply

In this appendix results of the sensitivity analyses on the key parameters of the physician supply model are reported and compared to the base case projection described in Appendix D. In this sensitivity analysis, changes in the values of the in-migration factor, H, the retention probability of California graduates, P(R|G), and the growth rate for California graduates, F, were considered. A summary of the values considered and the impacts on the physician to population ratio are shown in Table I-1. Figures I-2 to I-9 contain the computer print-outs for each of the cases identified in the summary table.

Table I-1. Physician Sensitivity Analysis Summary

	In-Migration Parameter		California Graduate Retention		California Graduates Growth Rates F(t) Values				1985 Physicians per 100,000	
	Value	Percentage of Change	Value	Percentage of Change	1975-80	1980-85	1985-90	Percentage of Change		Percentage of Change
Base Case	.927	-0-	.701	-0-	.0240	.0133	.0133	-0-	243	-0-
In-Migration Sensitivity										
Case 1	.083	-10%	.701	-0-	.0240	.0133	.0133	-0-	238	-2 %
2	.070	-25%	.701	-0-	.0240	.0133	.0133	-0-	230	-5 %
3	.046	-50%	.701	-0-	.0240	.0133	.0133	-0-	217	-12%
California Graduate Retention Sensitivity										
Case 4	.0927	-0-	.666	-5 %	.0240	.0133	.0133	-0-	242	-.5%
5	.0927	-0-	.631	-10%	.0240	.0133	.0133	-0-	241	-.9%
California Graduate Growth Sensitivity										
Case 6	.0927	-0-	.701	-0-	.0246	.0136	.0136	+ 2.5%	246	+1 %
7	.0927	-0-	.701	-0-	.0252	.0140	.0140	+ 5.0%	248	+2 %
8	.0927	-0-	.701	-0-	.0260	.0146	.0146	+10.0%	255	+5 %

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GROWTH FACTOR=1.000  VARIAT. IN P(RIG)=1.00  VARIAT. IN MIGRAT.=0.90

      ESTIMATED TOTAL LIC. & ACTIVE PHYSICIANS IN CALIFORNIA
                  1975          1980          1985          1990

        TOTAL    46165         54076         63043         72548
       ACTIVE    42646         49894         58062         66648
          R+I     6829          8446          9504         10383
           CA    35816         41447         48557         56266
   CALIF. PCP.   21206         22659         24363         26098
 MD'S/100.000      201           220           238           255

                       PHYSICIANS BY ORIGIN
       CALIF.    13147         15511         18212         21042
       U.S.      27967         32627         37793         43192
       FOREIGN    5050          5937          7037          8313

                     RESIDENTS & INTERNS BY ORIGIN
          R+I     6829          8446          9504         10383
            C     2050          2509          2632          3129
            U     4141          5137          5759          6244
            F      637           800           912          1009

                       OTHER PHYSICIANS BY ORIGIN
          CA     35816         41447         48557         56266
            C    10104         11810         13948         16213
            U    21693         24970         29053         33441
            F     4018          4666          5555          6611

                          CALIFORNIA GRADUATES

                      YEAR                GRADUATES

                      1976                      788
                      1977                      807
                      1978                      826
                      1979                      846
                      1980                      866
                      1981                      877
                      1982                      889
                      1983                      901
                      1984                      912
                      1985                      925
                      1986                      937
                      1987                      949
                      1988                      962
                      1989                      975
                      1990                      988
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Figure I-2. In-Migration Sensitivity - Case 1

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GROWTH FACTOR=1.000  VARIAT. IN P(R|G)=1.00  VARIAT. IN MIGRAT.=0.75

     ESTIMATED TOTAL LIC. & ACTIVE PHYSICIANS IN CALIFORNIA
                   1975          1980          1985          1990

         TOTAL    46165         53092         60937         69213
        ACTIVE    42646         48982         56121         63586
           R+I     6829          8245          9169          9934
            CA    35816         40737         46952         53652
    CALIF. POP.   21206         22059         24363         26098
  MD'S/100.000      201           216           230           243

                     PHYSICIANS BY ORIGIN
         CALIF.   13147         15511         18212         21042
         U.S.     27967         31800         36039         40440
         FOREIGN   5050          5780          6685          7730

                  RESIDENTS & INTERNS BY ORIGIN
           R+I     6829          8245          9169          9934
             C     2050          2509          2832          3129
             U     4141          4963          5472          5862
             F      637           771           863           942

                    OTHER PHYSICIANS BY ORIGIN
            CA    35816         40737         46952         53652
             C    10104         11810         13948         16213
             U    21693         24377         27723         31294
             F     4018          4549          5280          6144

                       CALIFORNIA GRADUATES

                     YEAR                 GRADUATES

                     1976                      788
                     1977                      807
                     1978                      826
                     1979                      846
                     1980                      866
                     1981                      877
                     1982                      889
                     1983                      901
                     1984                      912
                     1985                      925
                     1986                      937
                     1987                      949
                     1988                      962
                     1989                      975
                     1990                      988
```

Figure I-3. In-Migration Sensitivity - Case 2

```
GROWTH FACTOR=1.000  VARIAT. IN P(R|G)=1.00  VARIAT. IN MIGRAT.=0.50

      ESTIMATED TOTAL LIC. & ACTIVE PHYSICIANS IN CALIFORNIA
                        1975         1980         1985         1990

            TOTAL      46165        51452        57428        63654
           ACTIVE      42646        47462        52887        58480
              R+I       6829         7908         8610         9185
               CA      35816        39554        44276        49294
       CALIF. POP.     21206        22659        24363        26098
      MD'S/100.000       201          209          217          224

                          PHYSICIANS BY ORIGIN
            CALIF.     13147        15511        18212        21042
            U.S.       27967        30421        33117        35852
            FOREIGN     5050         5518         6098         6759

                      RESIDENTS & INTERNS BY ORIGIN
               R+I      6829         7908         8610         9185
                 C      2050         2509         2832         3129
                 U      4141         4674         4994         5225
                 F       637          724          783          831

                       OTHER PHYSICIANS BY ORIGIN
                CA     35816        39554        44276        49294
                 C     10104        11810        13948        16213
                 U     21693        23388        25506        27716
                 F      4018         4354         4821         5365

                             CALIFORNIA GRADUATES

                          YEAR               GRADUATES

                          1976                  788
                          1977                  807
                          1978                  826
                          1979                  846
                          1980                  866
                          1981                  877
                          1982                  889
                          1983                  901
                          1984                  912
                          1985                  925
                          1986                  937
                          1987                  949
                          1988                  962
                          1989                  975
                          1990                  988
```

Figure I-4. In-Migration Sensitivity - Case 3

```
GROWTH FACTOR=1.000  VARIAT. IN P(R|G)=0.95  VARIAT. IN MIGRAT.=1.00

      ESTIMATED TOTAL LIC. & ACTIVE PHYSICIANS IN CALIFORNIA
                    1975          1980          1985          1990

         TOTAL     46165         54606         64177         74347
        ACTIVE     42646         50386         59107         68300
           R+I      6829          8556          9686         10624
            CA     35816         41829         49421         57677
    CALIF. POP.    21206         22659         24363         26098
  MD'S/100.000       201           222           242           261

                     PHYSICIANS BY ORIGIN
        CALIF.     13148         15386         17942         20617
        U.S.       27967         33178         38962         45028
        FOREIGN     5050          6041          7272          8701

                 RESIDENTS & INTERNS BY ORIGIN
           R+I      6829          8556          9686         10624
             C      2050          2485          2791          3070
             U      4141          5252          5950          6499
             F       637           818           944          1054

                  OTHER PHYSICIANS BY ORIGIN
           CA      35816         41829         49421         57677
             C     10104         11718         13741         15881
             U     21693         25366         29940         34873
             F      4018          4744          5739          6922

                      CALIFORNIA GRADUATES

                  YEAR                    GRADUATES

                  1976                       788
                  1977                       807
                  1978                       826
                  1979                       846
                  1980                       866
                  1981                       877
                  1982                       889
                  1983                       901
                  1984                       912
                  1985                       925
                  1986                       937
                  1987                       949
                  1988                       962
                  1989                       975
                  1990                       988
```

Figure I-5. California Graduate Retention Sensitivity - Case 4

```
GROWTH FACTOR=1.000  VARIAT. IN P(R|G)=0.90  VARIAT. IN MIGRAT.=1.00

     ESTIMATED TOTAL LIC. & ACTIVE PHYSICIANS IN CALIFORNIA
                    1975        1980        1985        1990

         TOTAL     46165       54481       63907       73922
        ACTIVE     42646       50270       58059       67910
           R+I      6829        8532        9644       10565
            CA     35816       41737       49214       57345
    CALIF. POP.    21206       22659       24363       26098
   MD'S/100.000      201         221         241         260

                  PHYSICIANS BY ORIGIN
        CALIF.     13147       15261       17672       20192
        U.S.       27967       33178       38962       45028
        FOREIGN     5050        6041        7272        8701

               RESIDENTS & INTERNS BY ORIGIN
           R+I      6829        8532        9644       10565
             C      2050        2461        2749        3012
             U      4141        5252        5950        6499
             F       637         818         944        1054

                OTHER PHYSICIANS BY ORIGIN
            CA     35816       41737       49214       57345
             C     10104       11626       13534       15549
             U     21693       25366       29940       34873
             F      4018        4744        5739        6922

                  CALIFORNIA GRADUATES

                 YEAR              GRADUATES

                 1976                 788
                 1977                 807
                 1978                 826
                 1979                 846
                 1980                 866
                 1981                 877
                 1982                 889
                 1983                 901
                 1984                 912
                 1985                 925
                 1986                 937
                 1987                 949
                 1988                 962
                 1989                 975
                 1990                 988
```

Figure I-6. California Graduate Retention Sensitivity - Case 5

```
GROWTH FACTOR=1.025  VARIAT. IN P(R|G)=1.00  VARIAT. IN MIGRAT.=1.00

      ESTIMATED TOTAL LIC. & ACTIVE PHYSICIANS IN CALIFORNIA
                     1975         1980         1985         1990

          TOTAL      46165        54868        65062        76332
          ACTIVE     42646        50636        59949        70176
             R+I      6829         8683        10106        11438
             CA      35816        41952        49842        58740
     CALIF. POP.     21206        22659        24363        26098
   MD'S/100.000        201          223          246          268

                         PHYSICIANS BY ORIGIN
          CALIF.     13147        15648        18827        22602
          U.S.       27967        33178        38962        45028
          FOREIGN     5050         6041         7272         8701

                     RESIDENTS & INTERNS BY ORIGIN
             R+I      6829         8683        10106        11438
               C      2050         2612         3211         3884
               U      4141         5252         5950         6499
               F       637          818          944         1054

                       OTHER PHYSICIANS BY ORIGIN
             CA      35816        41952        49842        58740
               C     10104        11841        14162        16944
               U     21693        25366        29940        34873
               F      4018         4744         5739         6922

                         CALIFORNIA GRADUATES

                         YEAR               GRADUATES

                         1976                  808
                         1977                  848
                         1978                  890
                         1979                  934
                         1980                  980
                         1981                 1017
                         1982                 1057
                         1983                 1098
                         1984                 1140
                         1985                 1184
                         1986                 1230
                         1987                 1277
                         1988                 1327
                         1989                 1378
                         1990                 1431
```

Figure I-7. California Growth Sensitivity - Case 6

```
GROWTH FACTOR=1.050  VARIAT. IN P(R|G)=1.00  VARIAT. IN MIGRAT.=1.00

      ESTIMATED TOTAL LIC. & ACTIVE PHYSICIANS IN CALIFORNIA
                       1975         1980         1985         1990

            TOTAL     46165        55012        65771        78288
           ACTIVE     42646        50776        60634        72044
              R+I      6829         8792        10551        12430
               CA     35816        41983        50083        59615
       CALIF. POP.    21206        22659        24363        26098
     MD'S/100.000       201          224          248          276

                           PHYSICIANS BY ORIGIN
            CALIF.    13147        15791        19536        24559
            U.S.      27967        33178        38962        45028
            FOREIGN    5050         6041         7272         8701

                       RESIDENTS & INTERNS BY ORIGIN
                R+I    6829         8792        10551        12430
                  C    2050         2720         3656         4876
                  U    4141         5252         5950         6499
                  F     637          818          944         1054

                         OTHER PHYSICIANS BY ORIGIN
                CA    35816        41983        50083        59615
                  C   10104        11873        14403        17819
                  U   21693        25366        29940        34873
                  F    4018         4744         5739         6922

                           CALIFORNIA GRADUATES

                        YEAR                GRADUATES

                        1976                     827
                        1977                     890
                        1978                     957
                        1979                    1029
                        1980                    1106
                        1981                    1176
                        1982                    1252
                        1983                    1332
                        1984                    1417
                        1985                    1507
                        1986                    1604
                        1987                    1707
                        1988                    1816
                        1989                    1932
                        1990                    2056
```

Figure I-8. California Graduate Growth Sensitivity - Case 7

```
GROWTH FACTOR=1.100  VARIAT. IN P(R|G)=1.00  VARIAT. IN MIGRAT.=1.00

       ESTIMATED TOTAL LIC. & ACTIVE PHYSICIANS IN CALIFORNIA
                     1975          1980          1985          1990

          TOTAL     46165         55319         67523         83815
         ACTIVE     42646         51077         62329         77338
            R+I      6829          9025         11674         15411
             CA     35816         42052         50655         61928
     CALIF. POP.    21206         22659         24363         26098
    MD'S/100.000      201           225           255           296

                         PHYSICIANS BY ORIGIN
         CALIF.     13147         16099         21288         30086
         U.S.       27967         33178         38962         45028
         FOREIGN     5050          6041          7272          8701

                     RESIDENTS & INTERNS BY ORIGIN
            R+I      6829          9025         11674         15411
              C      2050          2953          4779          7857
              U      4141          5252          5950          6499
              F       637           818           944          1054

                       OTHER PHYSICIANS BY ORIGIN
             CA     35816         42052         50655         61928
              C     10104         11941         14975         20131
              U     21693         25366         29940         34873
              F      4018          4744          5739          6922

                         CALIFORNIA GRADUATES

                       YEAR                GRADUATES

                       1976                   867
                       1977                   976
                       1978                  1100
                       1979                  1239
                       1980                  1396
                       1981                  1556
                       1982                  1734
                       1983                  1933
                       1984                  2154
                       1985                  2401
                       1986                  2677
                       1987                  2984
                       1988                  3326
                       1989                  3707
                       1990                  4132
```

Figure I-9. California Graduate Growth Sensitivity - Case 8

APPENDIX D*

Methodology and Base Case for Registered Nurse Supply Projections and Migration Analysis

Basic Projection Methodology

In this appendix the approach used for projecting the number of active registered nurses in California consists of two steps. In the first step, the total future number of licensed RNs is estimated, and, in the second, the proportion of these licensed nurses actively employed in nursing is calculated. The methodology used for accomplishing the first step involves three tasks. First, losses in the current supply of licensed RNs due to attrition from death and nonrenewal of licenses are calculated. Second, additions to the supply from the expected flow of in-migrating RNs trained outside the state are estimated. Third, additions to this supply from the expected flow of new graduates from California schools are projected. Using this methodology to project the future number of licensed RNs implies a model reflecting fundamental age-related changes in the career patterns of RNs. This model can be expressed symbolically as:

$$RN(t) = \sum_{i} RN(i,t) \qquad (A\text{-}1)$$

$$AR(t) = \sum_{i} RN(i,t)P(A|R,i), \text{ and} \qquad (A\text{-}2)$$

$$RN(i,t) = R(i,t)+M(i,t)+G(i,t) \qquad (A\text{-}3)$$

$$R(i,t) = R(i-1,t-1)(1-d(i-1))(1-a(i-1)) \qquad (A\text{-}4)$$

$$M(i,t) = GUS(t-1)PU(i-1)+M(i-1,t-1)(1-d(i-1))(1-a(i-1)) \qquad (A\text{-}5)$$

$$G(i,t) = GC(t-1)PC(i-1)+G(i-1)(1-d(i-1))(1-a(i-1)) \qquad (A\text{-}6)$$

with

$$PU(i-1) = H\cdot APCU(i-1)(1-d(i-1))(1-a(i-1)) \qquad (A\text{-}7)$$

$$PC(i-1) = P(R|G)APCC(i-1)(1-d(i-1))(1-a(i-1)) \qquad (A\text{-}8)$$

where:

$RN(t)$ = the number of RNs licensed and living in California in time period t.

$AR(t)$ = the number of actively employed RNs in California in time period t.

---

*Revised February 1976.

$R(i,t)$ = the number of RNs of age i licensed and living in California in time period t stemming solely from the stock of RNs of year 1975.

$P(A|R,i)$ = the conditional probability that an RN will be active, given that she (or he) is licensed and living in the state and i years old (see Table A-12).

$R(i-1,t-1)$ = the number of RNs of age (i-1) licensed and living in California in time period (t-1).

$G(i-1,t-1)$ = the number of graduates from California schools of age (i-1) in time period (t-1)

$M(i-1,t-1)$ = the number of RNs graduated from schools in other states of age (i-1) moving to, licensed, and living in California in time period (t-1).

$P(R|G)$ = the conditional probability that registration will occur in California, given that the student has graduated from a California school (see pg. A-8).

$d(i-1)$ = the probability of death for RNs of age (i-1) in a given time period (see Table A-1).

$a(i-1)$ = the probability that an RN of age (i-1) will drop her or his license in a given time period (see Table A-1).

H = in-migration rate expressed as a proportion of new U.S. graduates (see pg. A-6).

GUS = estimated U.S. graduates (see Table A-7).

GC = estimated California graduates (see Table A-10).

$APCU$ = estimated age distribution of U.S. graduates who in-migrate to California (see Table A-8).

$APCC$ = estimated age distribution of new graduates of RN training programs in California (see Table A-5).

Attrition Factors

Table A-1 summarizes data on the total current supply of RNs licensed and living in California, the age distribution of these RNs, the attrition factors for each age group, and the number of those RNs estimated as surviving and retaining their licenses in 1980, 1985, and 1990. The first attrition factor, the probability of survival, is based on death rates for white females. These female death rates should provide sufficient accuracy since, nationally, over 98 percent of all registered nurses are female.

Table A-1. Current Supply of California RNs, Attrition Factors, and Projection after Attrition

Age	1975 R(i,t)*	Probability of Surviving (1-d(i))+	Probability of Retaining License (1-a(i))++	RNs Surviving and Retaining Licenses		
				1980	1985	1990
Under 25	3,158	.9994	1.000	-	-	-
25 to 34	35,153	.9991	.990	19,727	2,922	-
35 to 44	32,681	.9981	.983	31,229	30,387	16,816
45 to 54	33,093	.9953	1.004	31,903	29,375	28,004
55 to 64	22,795	.9898	1.000	27,005	31,487	30,326
65+	10,436	.965[illegible]	.970	13,486	16,250	19,788
Total	137,316			123,350	110,421	94,934

* Age distribution estimated from reference 2, pp. 23, 24.

** As of September 9, 1975; source: California Board of Nurse Education and Nurse Registration.

+ Death rates are those for white females taken from reference 3, pp. 16-17.

++ Estimated from references 1 and 2.

National data from references 1, 2, 4, and 5 provided the basis for calculating the second attrition factor, the probability of retaining a license. Starting with the total number of RNs in 1966, as shown in reference 1, survival rates were applied, and a new total and age distribution for 1972 were estimated. Using data from reference 4 on new graduates in the period from 1967 to 1972 and a new graduate age distribution, estimated as the age distrituion of newly licensed RNs in California (see Table A-2), the number of new graduates for the period by age distribution for new graduates who survived in 1972 were estimated and added to the estimated number of 1966 RNs who survived in that same year.

Table A-2. Estimated Age Distribution of New Graduates of RN Training Programs in the United States

Age	Proportion
Under 25	.419
25 to 34	.387
35 to 44	.131
45 to 54	.051
55 to 64	.012

Source: reference 5.

The sum of 1966 RNs and 1967-72 new graduates estimated as surviving in 1972, divided by the actual number, as published in reference 2, provides a measure for the rate of RNs by age group who dropped their licenses in the time interval used. Table A-3 contains this rate (see column 6), before being annualized, together with data on RNs and new graduates used in the calculations.

Table A-3. Total U.S. RNs, New Graduates, and Probabilities of Retaining Licenses

Age	(1) Total RNs 1966*	(2) Number Surviving 1972	(3) Surviving New Graduates 1967-72	(4) (2)+(3)	(5) Total RNs 1972**	(6) (4)÷(5) $(1-a(i))^6$
Under 25	74,987	-	73,214	73,214	73,214	1.000
25 to 34	244,615	201,700	123,659	325,359	307,207	.944
35 to 44	219,733	222,295	48,484	270,779	244,303	.902
45 to 54	165,126	200,176	16,381	216,557	222,965	1.030
55 to 64	108,072	138,164	2,674	140,838	141,564	1.000
65+	37,832	69,882	-	69,882	58,303	.834
Totals	850,365	832,217	264,412	1,096,629	1,047,556	

* The sum of inactive and employed RNs in reference 1.

** The sum of inactive and employed RNs in reference 2.

The Migration Rate

The base period used for estimating the migration rate of RNs trained outside the state of California is 1967 to 1973. The approach starts with the total number of RNs in the state in 1967. Survival rates were then applied, and a new total and age distribution for 1973 were estimated. Next, the number of new California school graduates in the base period surviving in 1973 was estimated.

New graduate data used in calculating the number of new California school graduates for the base period years are contained in Table A-4. The age distribution of these new graduates was estimated to be the same as the age distribution of newly licensed RNs in California who were licensed by examination (see Table A-5).

Table A-4. California Registered Nursing Educational Programs and Graduates

	Total		BA		AA		Diploma	
	Programs	Graduates	Programs	Graduates	Programs	Graduates	Programs	Graduates
1974	82	4,523	18	1,253	58	2,886	6	384
73	78	3,939	17	1,018	55	2,552	6	369
72	79	3,895	16	1,015	53	2,386	10	491
71	83	3,302	16	914	57	1,896	10	492
70	NA	3,071	NA	791	NA	1,775	NA	505
69	68	2,626	15	643	38	1,395	15	588
68	67	2,318	16	583	35	1,179	16	556
67	65	2,103	15	594	32	950	18	559
66	69	1,938	16	473	35	864	18	598
65	65	1,814	15	401	32	834	18	579
64	66	1,579	16	340	30	647	20	592

NA=not available.
Source: State of California Board of Nursing, Education and Registration.

Table A-5. Estimated Age Distribution of New Graduates of RN Training Programs in California

Age	Proportion
Under 25	.497
25 to 34	.335
35 to 44	.127
45 to 54	.038
55 to 64	.003

Source: reference 5.

Applying the survival rates and calculating a new total and age distribution for all new graduates between 1968 and 1973 provided an estimate of those new graduates in the base period who survived in 1973. These surviving new graduates were then added, by age group, to the surviving RNs of 1967. Finally, the probabilities of retaining licenses shown in Table A-1 were applied to derive an estimate of 1967 RNs and new graduates both surviving and retaining their licenses in 1973. The difference between this estimate and the actual number of RNs in 1973, as shown in reference 2, serves as a measure of the in-migration of RNs trained in schools outside the state.

From these results (see Table A-6), it is estimated that 12,267 RNs in-migrated to California during the six-year period from 1967 to 1973. During this same period, there were an estimated 264,412 new graduates in the nation (see reference 4). Thus the in-migration rate, expressed as a proportion of new graduates, is .046.*

Table A-6. Total California RNs, New Graduates, and Migration

Age	(1) Total RNs 1967†	(2) Number Surviving 1973	(3) Surviving New Graduates 1968-73	(4) Surviving (2) + (3)	(5) Surviving and Retaining Licenses 1973	(6) Actual 1973	(7) Total In-Migrations (6)-(5)
Under 25	5,188	-	8,622	8,622	8,622		
25 to 34	26,366	15,661	4,156	19,817	18,707		
35 to 44	28,061	26,839	3,245	30,084	27,136		
45 to 54	23,824	25,920	1,117	27,037	27,848		
55 to 64	16,412	20,078	175	20,253	20,253		
65+	6,036	14,153	-	14,153	11,804		
Totals	105,887	102,651	17,315	119,966	114,370	126,637	12,267

†Total from the Board of Nursing Education and Nurse Registration, and age distribution from reference 2.

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* It may have been preferable to express the in-migration rate as a proportion of total RNs in the nation. However, it was necessary to use new graduates as a base for the projections because data on the estimated total RNs for the 1975-90 period were not available.

Projecting Migration—Base Case

Using the migration rate and the estimated total U.S. graduates between 1976 and 1990 (see Table A-7), future in-migration to the state can be projected. The age distribution of in-migrating RNs was estimated to be the same as the age distribution of newly licensed RNs in California who were licensed by endorsement (see Table A-8).

Table A-7. Estimated U.S. Graduates

Year	Number
1976	70,077
1977	70,671
1978	71,293
1979	71,909
1980	72,518
1981	73,136
1982	73,745
1983	74,375
1984	75,060
1985	75,404
1986	75,620
1987	75,517
1988	75,415
1989	75,312
1990	75,209

Source: reference 4.

Table A-8. Estimated Age Distribution of RNs Migrating to California

Age	Proportion
Under 25	.32
25 to 34	.47
35 to 44	.14
45 to 54	.05
55 to 64	.02

Source: reference 5.

Table A-9 shows the estimated total number of RNs migrating to California, who will both survive and retain licenses in 1980, 1985, and 1990, using the methodology described in this appendix.

Table A-9. Estimated RNs Migrating to California between 1976 and 1990 Using Base Case Migration Rate

Age	1980	1985	1990
Under 25	2,236	2,329	2,365
25 to 34	8,015	14,956	17,526
35 to 44	3,409	8,939	16,267
45 to 54	1,326	3,164	6,287
55 to 64	511	1,393	2,730
65+	49	208	621
Totals	15,546	30,989	45,796

California Graduates

To estimate the number of California graduates between 1976 and 1990, it is assumed that the rate of growth in the number of these graduates will be the same as that for the nation as a whole, as estimated in reference 4. The annual rate of growth, $F(t)$ for each five year period calculated from the data in Table A-7 is as follows: 1976-80 = .0086, 1981-85 = .0077, and 1986-90 = -.0014. Table A-10 shows the estimated number of California graduates by year, using these assumed rates of growth according to equation A-9:

$$GC(t) = GC(t-1) \cdot F(t) \qquad \text{(A-9)}$$

The conditional probability that a California graduate will become licensed in California was calculated from data in references 5 and 6. The total number of graduates in California in 1974 was 4,523 (reference 6), while the total number who obtained licenses by taking an examination was 4,470 (reference 5). The ratio of these numbers is taken as a measure of the conditional probability, i.e., $P(R|G) = 4{,}470/4{,}523 = .988$.

Table A-10. California Graduates, Base Case Projection—1976 to 1990.

Year	Estimated California Graduates
1975	4,980
1976	5,022
1977	5,065
1978	5,108
1979	5.151
1980	5,195
1981	5,235
1982	5,275
1983	5,315
1984	5,355
1985	5,396
1986	5,388
1987	5,380
1988	5,372
1989	5,364
1990	5,356

To calculate the number of California graduates in the period 1976-90 who will obtain licenses and both survive and retain licenses, the conditional probability, the survival rates, and the rates for the probability of retaining a license were applied to the estimated number of graduates. The age distribution of the graduates used in these calculations is shown in Table A-5. Table A-11 contains the estimated number of new California graduates who will be RNs in 1980, 1985, and 1990, using the methodology described in this appendix.

Active Registered Nurses

The final step in projecting the number of active RNs in the state is to apply the conditional probability that a licensed RN will be active to the total number of registered nurses in each age group. The values for this conditional probability, $P(A|R,i)$, calculated from the actual 1972 proportion of active RNs in each age group, are shown in Table A-12.

Table A-11. Estimated New California Graduates between 1976 and 1990—Base Case

Age	1980	1985	1990
Under 25	5,005	5,208	5,264
25 to 34	12,989	26,836	32,267
35 to 44	4,475	11,140	22,845
45 to 54	1,548	4,100	8,176
55 to 64	305	1,036	2,567
65+	4	20	263
Totals	24,326	48,340	71,382

Table A-12. Conditional Probability that a Licensed California RN in Age Group i is Active

Age	$P(A\|R,i)$
Under 25	.903
25 to 34	.731
35 to 44	.660
45 to 54	.704
55 to 64	.653
65+	.370
All Ages	.669

Source: reference 2.

The resultant estimated number of active RNs in California in 1975, 1980, 1985 and 1990 is shown in Table A-13. This table also contains the total number of RNs who are licensed and living in the state in those years and the number and percentage of RNs who are surviving 1975 RNs, who will be migrating to California between 1976 and 1990, or who will be graduating from California nurse training programs between 1976 and 1990. The bottom line of the table lists the number of active RNs per 100,000 persons. The estimates of the future number of active RNs in California are analyzed and evaluated in the section on registered nurses in the body of this report.

APPENDIX D

Sensitivity Analysis of Future California Registered Nurse Supply

In this appendix results of the sensitivity analyses on the key parameters of the RN supply model are reported and compared to the base case projection described in Appendix A. In this sensitivity analysis, changes in the values of the in-migration factor, H, the retention probability of California graduates, $P(R|G)$, and the growth rate for California graduates, F, were considered. A summary of the values considered and the impacts on the RN to population ratio are shown in Table F-1. Figures F-2 to F-8 contain the computer print-outs for each of the cases identified in the summary table.

Table F-1. Registered Nurse Sensitivity Analysis Summary

	In-Migration Parameter		California Graduate Retention		California Graduate Growth Rates F(t) Values					
	H Value	Percentage of Change	P(R|G) Value	Percentage of Change	1975-80	1980-85	1985-90	Percentage of Change	1985 RNs Per 100,000	Percentage of Change
Base Case	.046	-0-	.988	-0-	.0086	.0077	-.0014	-0-	521	
In-Migration Sensitivity										
Case 1	.042	-10%	.988	-0-	.0086	.0077	-.0014	-0-	513	-1.5%
2	.035	-25%	.988	-0-	.0086	.0077	-.0014	-0-	499	-4.2%
3	.023	-50%	.988	-0-	.0086	.0077	-.0014	-0-	476	-8.9%
California Graduate Retention Sensitivity										
Case 4	.046	-0-	.950	- 4%	.0086	.0077	-.0014	-0-	516	-1.2%
5	.046	-0-	.900	-10%	.0086	.0077	-.0014	-0-	508	-2.5%
California Graduate Growth Sensitivity										
Case 6	.046	-0-	.988	-0-	.0088	.0079	NA	+2.5%	540	+3.5%
7	.046	-0-	.988	-0-	.0090	.0081	NA	+5.0%	561	+7.7%

NA = not applicable because of negative value for base case.

```
  ESTIMATED TOTAL LICENSED AND ACTIVE RN'S IN CALIFORNIA IN 1975,1980,1985 AND 1990

                                      1975          1980          1985          1990

TOTAL LICENSED RN'S                 157316        167103        187503        203763
ACTIVE RN'S                          92161        108949        125153        138605
   SURVIV. & LIC. 1975 RN'S              0         80115         69443         57938
   MIGRATING RN'S, 1976-1990             0         10500         20363         29512
   CALIF. GRADUATES 1976-1990            0         18332         35349         51159
CALIF. POPUL. (THOUSANDS)            21206         22655         24363         26098
ACTIVE RN'S PER 100,000                434           480           513           531

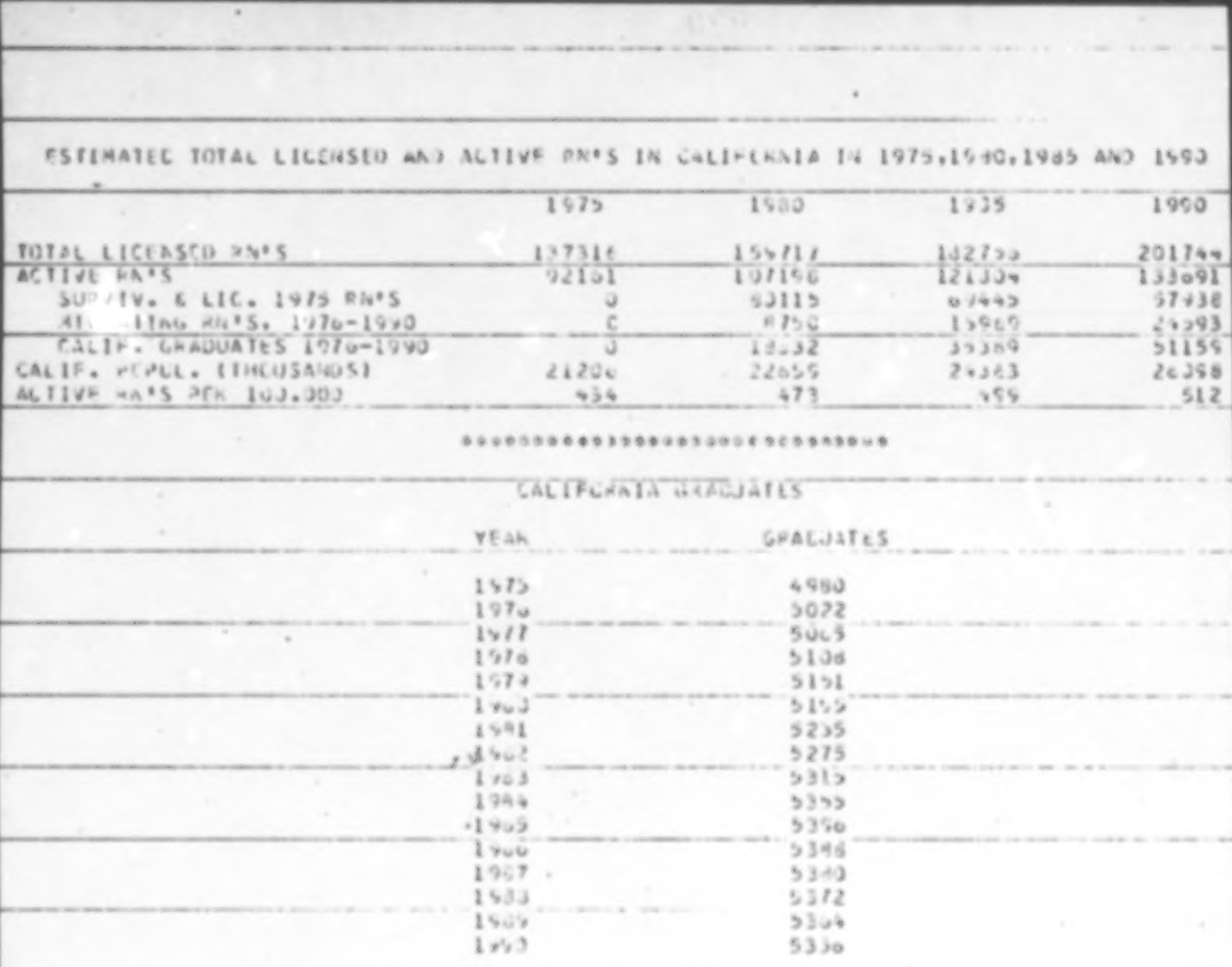
                                 ******************************

                                      CALIFORNIA GRADUATES

                                  YEAR                     GRADUATES

                                  1975                       4960
                                  1976                       5022
                                  1977                       5065
                                  1978                       5108
                                  1979                       5151
                                  1980                       5195
                                  1981                       5235
                                  1982                       5275
                                  1983                       5315
                                  1984                       5355
                                  1985                       5396
                                  1986                       5288
                                  1987                       5370
                                  1988                       5372
                                  1989                       5364
                                  1990                       5356
```

Figure F-2. In-Migration Sensitivity - Case 1



```
 ESTIMATED TOTAL LICENSED AND ACTIVE RN'S IN CALIFORNIA IN 1975,1980,1985 AND 1990

                                       1975          1980          1985          1990

TOTAL LICENSED RN'S                  137316        158717        182755        201744
ACTIVE RN'S                           92161        107196        121304        133691
   SURVIV. & LIC. 1975 RN'S               0         83115         67445         57938
   IN-MIGRATING RN'S, 1976-1990           0          8750         15969         24593
   CALIF. GRADUATES 1976-1990             0         15332         35389         51159
CALIF. POPUL. (THOUSANDS)             21206         22655         24383         26098
ACTIVE RN'S PER 100.000                 434           473           499           512

                          ******************************

                          CALIFORNIA GRADUATES

                          YEAR               GRADUATES

                          1975                 4980
                          1976                 5022
                          1977                 5065
                          1978                 5108
                          1979                 5151
                          1980                 5195
                          1981                 5235
                          1982                 5275
                          1983                 5315
                          1984                 5355
                          1985                 5396
                          1986                 5348
                          1987                 5340
                          1988                 5372
                          1989                 5364
                          1990                 5336
```

Figure F-3. In-Migration Sensitivity - Case 2

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  ESTIMATED TOTAL LICENSED AND ACTIVE RN'S,IN CALIFORNIA IN 1975,1980,1985 AND 1990

                                          1975          1980          1985          1990

TOTAL LICENSED RN'S                     137316        155626        174637        189713
ACTIVE RN'S                              92161        104198        115986        125259
   SURVIV. & LIC. 1975 RN'S                  0         80115         69445         57938
   MIGRATING RN'S, 1976-1990                 0          5750         11151         16161
   CALIF. GRADUATES 1976-1990                0         18332         35389         51159
CALIF. POPUL. (THOUSANDS)                21206         22659         24363         26098
ACTIVE RN'S PER 100,000                    434           459           476           475

                                  ******************************

                                      CALIFORNIA GRADUATES

                                  YEAR                GRADUATES

                                  1975                   4980
                                  1976                   5022
                                  1977                   5065
                                  1978                   5108
                                  1979                   5151
                                  1980                   5195
                                  1981                   5235
                                  1982                   5275
                                  1983                   5315
                                  1984                   5355
                                  1985                   5396
                                  1986                   5388
                                  1987                   5380
                                  1988                   5372
                                  1989                   5364
                                  1990                   5356
```

Figure F-4. In-Migration Sensitivity - Case 3

```
ESTIMATED TOTAL LICENSED AND ACTIVE RN'S IN CALIFORNIA IN 1975,1980,1985 AND 1990

                                        1975          1980          1985          1990

TOTAL LICENSED RN'S                   157316        162326        183357        210015
ACTIVE RN'S                            92161        109244        125776        139452
   SURVIV. & LIC. 1975 RN'S                0         80115         69445         57938
   MIGRATING RN'S. 1976-1990               0         11502         22303         32323
   CALIF. GRADUATES 1976-1990              0         17627         34028         49191
CALIF. POPUL. (THOUSANDS)              21200         22655         24363         26098
ACTIVE RN'S PER 100.000                  434           482           516           534

                                *******************************

                                     CALIFORNIA GRADUATES

                                YEAR                    GRADUATES

                                1975                      4940
                                1976                      5022
                                1977                      5065
                                1978                      5108
                                1979                      5151
                                1980                      5195
                                1981                      5235
                                1982                      5275
                                1983                      5315
                                1984                      5355
                                1985                      5396
                                1986                      5338
                                1987                      5390
                                1988                      5372
                                1989                      5354
                                1990                      5336
```

Figure F-5. California Graduate Retention Sensitivity - Case 4

ESTIMATED TOTAL LICENSED AND ACTIVE RN'S IN CALIFORNIA IN 1975,1980,1985 AND 1990

	1975	1980	1985	1990
TOTAL LICENSED RN'S	137316	161263	193295	226306
ACTIVE RN'S	97161	122316	123945	136263
SURVIV. & LIC. 1975 RN'S	0	60115	45665	37438
MIGRATING RN'S, 1976-1990	0	11960	22323	32323
CALIF. GRADUATES 1976-1990	0	[illegible]	32237	46032
CALIF. POPUL. (THOUSANDS)	21636	22659	24363	26038
ACTIVE RN'S PER 100,000	456	478	510	524

****

CALIFORNIA GRADUATES

YEAR	GRADUATES
1975	4962.
1976	5082
1977	5065
1978	5102
1979	5121
1980	5179
1981	5733
1982	5270
1983	5315
1984	5355
1985	5256
1986	5226
1987	5340
1988	5377
1989	5364
1990	5356

Figure F-6. California Graduate Retention Sensitivity - Case 5

```
ESTIMATED TOTAL LICENSED AND ACTIVE RN'S IN CALIFORNIA IN 1975,1980,1985 AND 1990

                                        1975          1980          1985          1990

TOTAL LICENSED RN'S                   137316        164744        190289        227534
ACTIVE RN'S                            92161        110921        131663        157223
   SURVIV. & LIC. 1975 RN'S                0         83115         65465         57538
   MIGRATING RN'S. 1976-1990               0         11920         22303         32323
   CALIF. GRADUATES 1976-1990              0         17315         37914         61962
CALIF. POPUL. (THOUSANDS)              21206         22654         24263         26366
ACTIVE RN'S PER 100,000                  434           489           543           593

                    ******************************

                         CALIFORNIA GRADUATES

                    YEAR                      GRADUATES

                    1975                        4560
                    1976                        5148
                    1977                        5222
                    1978                        5531
                    1979                        5667
                    1980                        5676
                    1981                        6072  *
                    1982                        6271
                    1983                        6477
                    1984                        6690
                    1985                        6910
                    1986                        7012
                    1987                        7235
                    1988                        7430
                    1989                        7532
                    1990                        7700
```

Figure F-7. California Graduate Growth Sensitivity - Case 6

```
  ESTIMATED TOTAL LICENSED AND ACTIVE RN'S IN CALIFORNIA IN 1975,1980,1985 AND 1990

                                         1975          1980          1985          1990

TOTAL LICENSED RN'S                    157516        196642        233217        245875
ACTIVE RN'S                             92161        111562        130863        143735
   SURVIV. & LIC. 1975 RN'S                 0         90115         69463         57338
   MIGRATING RN'S. 1976-1990                0         11970         22303         32325
   CALIF. GRADUATES 1976-1990               0         20245         49095         75474
CALIF. POPUL. (THOUSANDS)               21230         22855         24563         26053
ACTIVE RN'S PER 100,000                   434           494           541           835


                    ********************************

                       CALIFORNIA GRADUATES

                     YEAR                GRADUATES

                     1975                  4980
                     1976                  5273
                     1977                  5584
                     1978                  5913
                     1979                  6262
                     1980                  6631
                     1981                  7016
                     1982                  7423
                     1983                  7854
                     1984                  8310
                     1985                  8792
                     1986                  9218
                     1987                  9665
                     1988                 10134
                     1989                 10625
                     1990                 11140
```

Figure F-8. California Graduate Growth Sensitivity - Case 7

APPENDIX D

Methodology and Base Case for Dentist Supply Projections and Migration Analysis

Basic Projection Methodology

In this appendix the approach used for projecting the number of total active dentists in California consists of two steps. In the first step, the total future number of dentists is estimated. In the second, the proportion of those dentists actively employed is calculated. The methodology used for accomplishing the first step involves three tasks. First, losses in the current supply of dentists due to attrition from death are calculated. Second, net additions to the supply from the expected flow of new graduates from California dental schools are projected. Third, net additions to this supply from the expected flow of in-migrating dentists trained outside the state are estimated. In estimating additions to the supply, a distinction is made between dentists trained in the state and dentists trained outside the state—i.e., those who are graduates of U.S. dental schools and those who attended foreign dental schools.

Using this methodology to project the future number of dentists implies a model reflecting fundamental age-related changes in the career problems of dentists. This model can be expressed symbolically as:

$$TD(t) = \sum_{i} TDD(i,t) \qquad \text{(E-1)}$$

$$TAD(t) = \sum_{i} TDD(i,t)PAR(i) \qquad \text{(E-2)}$$

$$TDD(i,t) = TDC(i,t)+TDU(i,t)+TDF(i,t) \qquad \text{(E-3)}$$

$$TDC(i,t) = TDC(i-1,t-1)(1-d(i-1))+DC(i-1,t-1) \qquad \text{(E-4)}$$

$$TDU(i,t) = TDU(i-1,t-1)(1-d(i-1))+DU(i-1,t-1) \qquad \text{(E-5)}$$

$$TDF(i,t) = TDF(i-1,t-1)(1-d(i-1))+DF(i-1,t-1) \qquad \text{(E-6)}$$

$$DC(i-1,t-1) = \sum_{m=1}^{10} CC(m)APCC(i-m)GC(t-m-1) \qquad \text{(E-7)}$$

$$DU(i-1,t-1) = \sum_{m=1}^{10} CU(m)APCU(i-m)GU(t-m-1) \qquad (E-8)$$

$$DF(i-1,t-1) = FP \cdot DU(i-1,t-1) \qquad (E-9)$$

TD(t) = the number of dentists licensed and living in California in time period t.

TAD(t) = the number of active dentists living in California in time period t.

PAR(i) = the conditional probability that a dentist will be active full time, given that he or she is licensed and living in California and i years old (Table E-8).

TDD(i,t) = the number of dentists of age i licensed and living in California in time period t.

TDC(i,t) = the number of dentists of age i, who graduated from California dental schools and are licensed and living in California in time period t.

TDU(i,t) = the number of dentists of age i, who graduated from U.S. dental schools and are licensed and living in California in time period t.

TDF(i,t) = the number of dentists of age i, who graduated from foreign dental schools, who are licensed and living in California in time period t.

TDC(i-1,t-1) = the number of dentists of age (i-1) who graduated from California dental schools, who were licensed and living in California in time period (t-1), and who were also practicing in California in time period (t-1).

TDU(i-1,t-1) = the number of dentists of age (i-1) who graduated from U.S. dental schools, who were licensed and living in California in time period (t-1), and who were also practicing in California in time period (t-1).

TDF(i-1,t-1) = the number of dentists of age (i-1) who graduated from foreign dental schools, who were licensed and living in California in time period (t-1) and who were also practicing in California in time period (t-1).

DC(i-1,t-1) = the number of dentists of age (i-1) who graduated from California dental schools and who first took up practice in California in time period (t-1).

DU(i-1,t-1) = the number of dentists of age (i-1) who graduated from U.S. dental schools and who first took up practice in California in time period (t-1).

DF(i-1,t-1) = the number of dentists of age (i-1) who graduated from foreign dental schools and who first took up practice in California in time period (t-1).

FP = a factor expressing the number of foreign dental school graduates who take up practice in California for the first time in time period (t-1) as a fraction of U.S. graduates who take up such practice in California for the first time in time period (t-1).

CC(m) = the fraction of graduates of California dental schools who take up practice in California m years after graduation (Table E-4).

CU(m) = the fraction of graduates of U.S. dental schools who take up practice in California m years after graduation (Table E-3).

APCC(i-m) = the fraction of each graduating class of California dental schools that is i years old m years after graduation (Table E-6).

APCU(i-m) = the fraction of each graduating class of U.S. dental schools that is i years old m years after graduation (Table E-6).

GC(t-m-1) = the number of California dental school graduates in year (t-m-1) (Table E-7).

GU(t-m-1) = the number of U.S. dental school graduates in year (t-m-1) (Table E-5).

m = the number of years since graduation (tables E-3 and E-6).

d(i-1) = the probability of death for dentists of age (i-1) in a given time period.

The Estimated Existing Supply

The current supply of licensed dentists in California is comprised of those trained in the state, those trained in the United States but outside of California, and those trained in foreign countries. The distribution of dentists by location of education is shown in Table E-1.

Table E-1. Distribution of Licensed Dentists by Location of Education

	Number	Percentage
California graduates	8,979	61.8
Other U.S. graduates	5,343	36.8
Foreign graduates	200	1.4
Total	14,522	100.0

The data in Table E-1 were derived from the California state board of licensing and the American Dental Association (ADA) master computer tapes of dentists, with the total number of dentists being taken from the board figures and the distribution by age and category being taken from the ADA tapes.

The age distribution of this supply of licensed dentists, which is necessary to implement the projection methodology described in this appendix, is summarized in Table E-2, together with the probability of surviving for each age group (see equations E-3 to E-6 and the accompanying definitions).

Migration Rates

The migration rates are that proportion of graduates trained outside the state who in-migrate to the state and that proportion of California graduates who out-migrate. In estimating these migration rates, it is assumed that they are a function of the years since graduation. In the years immediately following graduation, new graduates complete specialty training and eventually settle in a relatively permanent location to continue their practice. The observed patterns for California dentists, as described below, indicate that the majority of California graduates who practice in the state begin practice here immediately after graduation.

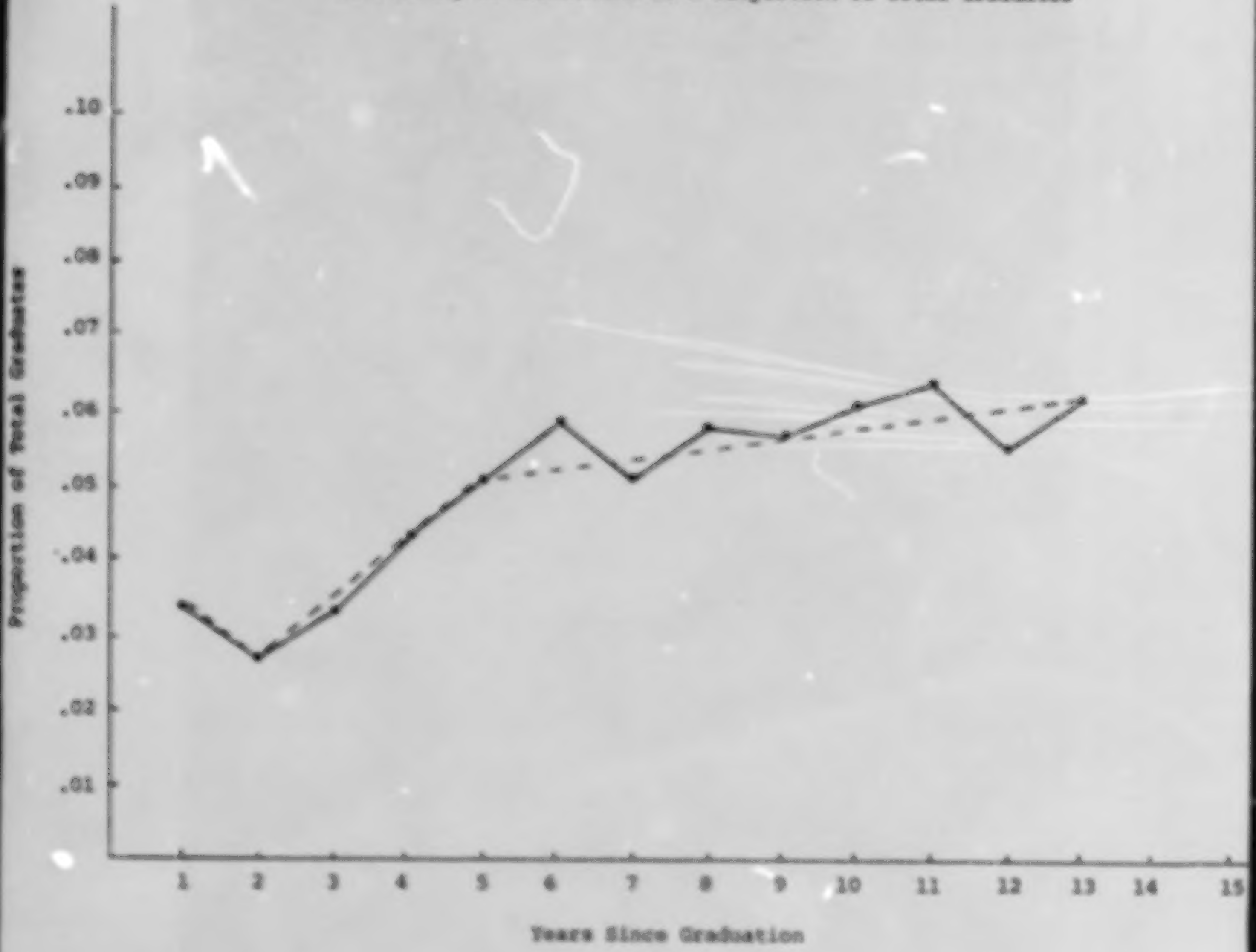
Table E-2. Age Distribution of the 1975 Supply and Probability of Surviving

	Licensed Dentists Number	 %	Probability of Surviving (1-d(i))
Under 25	693	4.8	.9980
25 to 29	1,815	12.5	.9983
30 to 34	2,088	14.4	.9982
35 to 39	1,653	11.4	.9974
40 to 44	1,692	11.7	.9959
45 to 49	1,346	9.3	.9932
50 to 54	1,552	10.7	.9891
55 to 59	988	6.8	.9825
60 to 64	654	4.5	.9733
65 to 69	630	4.3	.9602
70+	1,411	9.6	.9184
Total	14,522	100.0	

In-Migration of U.S. Graduates

Slightly over one-third of 1975 California dentists were trained outside the state (see Table E-1). Figure E-1 shows the pattern of in-migration as a function of years since graduation as it was derived from the ADA computer tapes. According to the data on these tapes, about three percent in-migrate within the first two years after graduation, and this proportion gradually increases to almost six percent over the ensuing ten years. However, INTERPLAN estimates show that these patterns would result in too rapid a growth of in-migrants which would be inconsistent with the national growth. Consequently, INTERPLAN adjusted these values to 67 percent of their original value, which appears to yield a very realistic pattern for the base case projection.

Figure E-1. Graduates of United States, Non-California Dental Schools Practicing in California as a Proportion of Total Graduates



From smoothed curves fit to the data in Figure E-1, the fraction of dental graduates of U.S. schools who take up practice in California m years after graduation (CU(m)) can be calculated. These factors, which are used in equation E-7 reduced to 67 percent for the base case projection, are shown in Table E-3.

Out-Migration of California Graduates

The observed pattern of out-migration of California graduates as given by the ADA computer tapes starts at about 25 percent one year after graduation and gradually decreases to about 15 percent. Thus, California retains about 85 percent of its dental graduates. Figure E-2 shows this trend. This pattern has also been adjusted to 67 percent of the original values taken from the ADA computer tapes. Thus, the adjusted retention rate is only 58 percent. From the smoothed curves fit to the data in Figure E-2, the fraction of graduates who take up practice in California m years after graduation (CC(m)) can be calculated. The age distribution of these dentists migrating out of the state is based on the age distribution of dental school graduates (APCC, Table E-6). These factors, which are used in equation E-8 reduced to 67 percent for the base case projection, are shown in Table L-4.

Projecting In-Migration of U.S. Graduates—Base Case

Using the adjusted migration rates and the estimated total number of U.S. graduates between 1976 and 1990 (see Table E-5), future in-migration of non-California, U.S. graduates can be projected. The age distribution of these dentists migrating to the state is based on the age distribution of dental school graduates (APCU, Table E-6) as shown in Table E-3.

Projecting In-Migration of Foreign Graduates—Base Case

In 1975, foreign graduates equalled 3.75 percent of non-California, U.S.-trained dentists. For the base case projection, it is assumed that this proportion will remain constant between 1970 and 1990.

Table E-3. Fraction of U.S. Graduates Taking up Practice in California m Years After Graduation—Base Case

Years Since Graduation	Fraction of Graduates
1	+.0348
2	-.0069
3	+.0059
4	+.0128
5	+.0059
6	+.0014
7	+.0014
8	+.0014
9	+.0014
10	+.0014

Source: ADA Master Dentists Tapes

Figure E-2. Graduates of California Dental Schools Practicing in California as a Proportion of Total Graduates

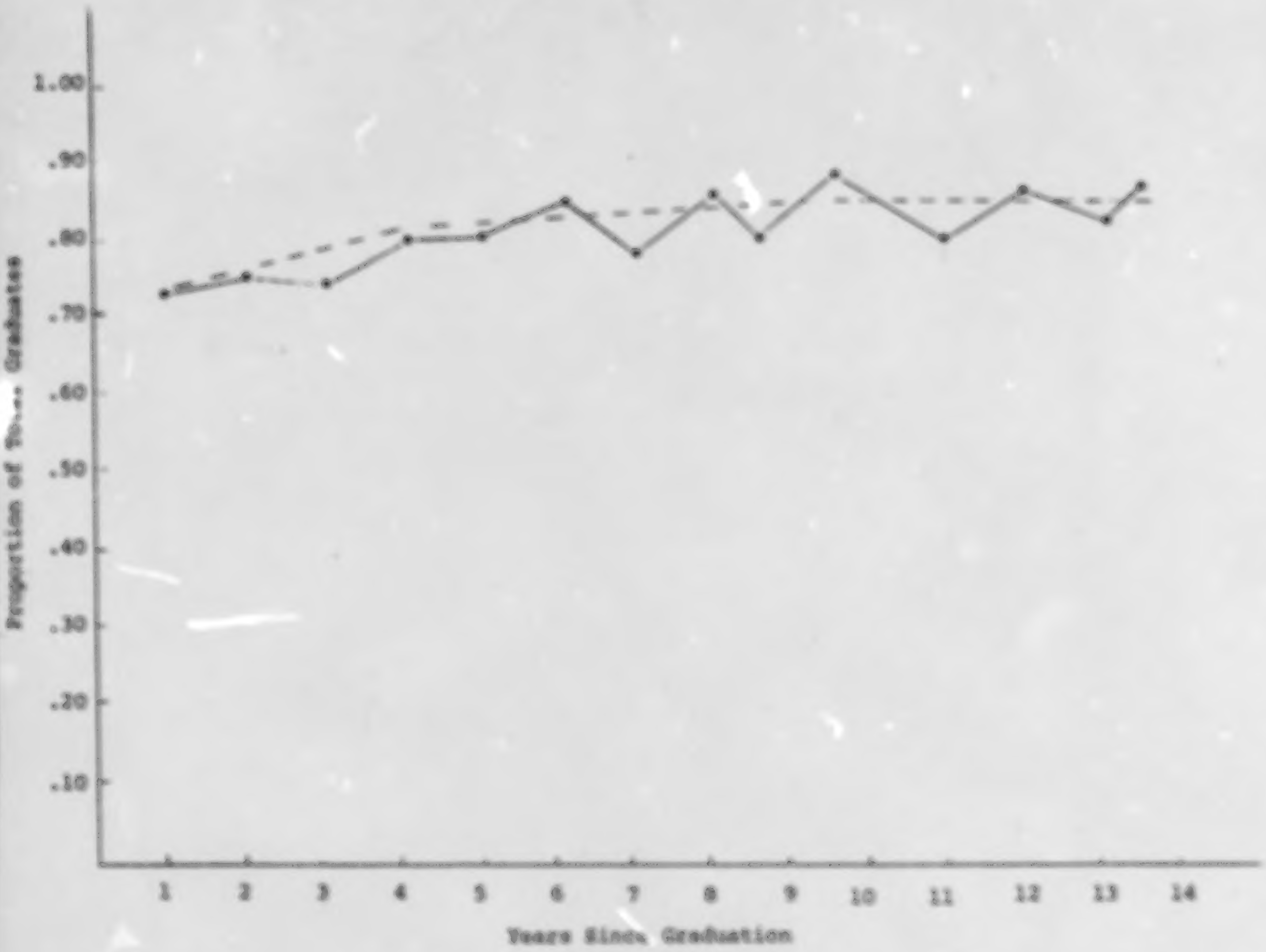


Table E-4. Fraction of California Graduates Taking up Practice in California m Years After Graduation--Base Case

Years Since Graduation	Fraction of Graduates
1	+.753
2	+.023
3	+.022
4	+.023
5	+.005
6	+.005
7	+.005
8	+.005
9	+.005
10	+.005

Source: ADA Master Dentists Tapes

Table E-5. Estimated U.S. Graduates

Year	Number
1976	5,060
1977	5,140
1978	5,210
1979	5,290
1980	5,370
1981	5,440
1982	5,440
1983	5,440
1984	5,440
1985	5,440
1986	5,440
1987	5,440
1988	5,440
1989	5,440
1990	5,440

Source: Reference 4

Table E-6. Age Distribution of Dental School Graduates

Age	Percent
Under 25	3.7
25 to 29	76.3
30 to 34	14.6
35 to 39	3.2
40 to 44	1.9
45 to 49	.3
50 to 54	0.0
55+	0.0
Total	100.0

683

California Graduates

To estimate the number of California graduates between 1976 and 1990, it is assumed that the rate of growth in the number of these graduates is the same as that for the nation as a whole, as estimated in reference 4. This annual rate of growth, F(t), for each five year period calculated from the data in Table E-4 is as follows: 1976-80 = .014, 1981-85 = .000, and 1986-90 = .000. Table E-7 shows the estimated number of California graduates for the base case, using the assumed rates of growth according to equation E-10:

$$GC(t) = GC(t-1) \cdot F(t).$$

Table E-7. California Graduates, Base Case Projection—1976 to 1990

Year	Graduates
1976	477
1977	483
1978	489
1979	495
1980	501
1981	508
1982	508
1983	508
1984	508
1985	508
1986	508
1987	508
1988	508
1989	508
1990	508

Base Case Projection of Active Dentists

The total number of licensed dentists in California can be estimated by using the existing supply as a point of departure, applying the attrition rates and estimating the additions from California, U.S., and foreign graduates. The final step is estimating the number who will be active by applying the probability that a dentist of age i will also be active. The values for this conditional probability, P(A|R,i), estimated by INTERPLAN, are shown in Table E-8.

Table E-8. Conditional Probability that a Licensed California Dentist in Age Group i is Active

Age	P(A|R,i)
Under 44	.8628
45 to 49	.8628
50 to 54	.8628
55 to 59	.8628
60 to 64	.8628
65 to 69	.8628
70+	.8628

The resultant estimated number of active dentists in 1975, 1980, 1985 and 1990 is shown in Table E-9. This table also shows the breakdown of these estimates according to California, U.S., and foreign graduates. These estimates of the future number of active dentists in California are analyzed and evaluated in the section on dentists in the body of this report.

Table E-9. Base Case Estimated Total Licensed and Total Active Dentists in California

	1975		1980		1985		1990	
	Number	%	Number	%	Number	%	Number	%
Total Licensed Dentists	14,522		16,729		19,067		21,324	
Total Active Dentists	12,529	100.0	14,433	100.0	16,451	100.0	18,398	100.0
California graduates	7,747	61.8	8,852	61.3	9,992	60.7	11,078	60.2
Other U.S. graduates	4,610	36.8	5,379	37.3	6,225	37.8	7,055	38.3
Foreign graduates	172	1.4	201	1.4	233	1.5	264	1.5
California Population (thousands)	21,206		22,659		24,363		26,098	
Active Dentists 100,000	59		63		67		70	

APPENDIX D

Sensitivity Analysis of Future California Dentist Supply

In this appendix results of the sensitivity analyses on the key parameters of the dentist supply model are reported and compared to the base case projection described in Appendix E. In this sensitivity analysis, changes in the values of the in-migration factor, M, the retention probability of California graduates, P(R|G), and the growth rate for California graduates, F, were considered. A summary of the values considered and the impacts on the dentist-to-population ratio are shown in Table J-1. Figures J-2 to J-9 contain the computer print-outs for each of the cases identified in the summary table.

Table J-1. Dentist Sensitivity Analysis Summary

	In-Migration Parameter		California Graduate Retention		California Graduates Growth Rates				1985 Dentists per 100,000	Percentage of Change
	Value	Percentage of Change	Value	Percentage of Change	F(t) Values			Percentage of Change		
					1975-80	1980-85	1985-90			
Base Case	.0594	-0-	.854	-0-	.0140	.000	.000	-0-	67	-0-
In-Migration Sensitivity										
Case 1	.0535	-10%	.854	-0-	.0140	.000	.000	-0-	66	-1.5
2	.0446	-25%	.854	-0-	.0140	.000	.000	-0-	65	-3.1
3	.0297	-50%	.854	-0-	.0140	.000	.000	-0-	63	-6.3
California Graduate Retention Sensitivity										
Case 4	.0594	-0-	.811	- 5%	.0140	.000	.000	-0-	67	0.0
5	.0594	-0-	.769	-10%	.0140	.000	.000	-0-	66	-1.5
California Graduate Growth Sensitivity										
Case 6	.0594	-0-	.854	-0-	.0144	.000	.000	+ 2.5%	68	+1.5
7	.0594	-0-	.854	-0-	.0147	.000	.000	+ 5.0%	69	+3.0
8	.0594	-0-	.854	-0-	.0154	.000	.000	+10.0%	73	+9.0

ESTIMATED TOTAL LICENSED AND ACTIVE DENTISTS IN CALIFORNIA

	1975	1980	1985	1990
TOTAL LIC. DENTISTS	14522	16621	18361	21010
ACTIVE DENTISTS	12529	14546	16273	18127
CALIF.	7747	9092	9993	11078
U.S.	4610	5256	6054	6794
FOREIGN	172	198	226	254
CALIF. POPUL. (THOUSANDS)	21206	22659	24361	26298
ACTIVE DENTISTS/100.000	59	63	66	69

****

CALIFORNIA GRADUATES

YEAR	GRADUATES
1975	471
1976	477
1977	483
1978	489
1979	495
1980	501
1981	508
1982	508
1983	508
1984	508
1985	508
1986	508
1987	508
1988	508
1989	508
1990	508

Figure J-2. In-Migration Sensitivity - Case 1

ESTIMATED TOTAL LICENSED AND ACTIVE DENTISTS IN CALIFORNIA

	1975	1980	1985	1990
TOTAL LIC. DENTISTS	14322	16465	18551	20529
ACTIVE DENTISTS	12529	14223	15937	17773
CALIF.	7741	8852	9952	11070
U.S.	4616	5176	5768	6467
FOREIGN	172	195	217	236
CALIF. POPUL. (THOUSANDS)	21206	22659	24351	26343
ACTIVE DENTISTS/100.000	59	62	65	67

****

CALIFORNIA GRADUATES

YEAR	GRADUATES
1975	471
1976	477
1977	483
1978	489
1979	495
1980	501
1981	508
1982	508
1983	508
1984	508
1985	508
1986	508
1987	508
1988	508
1989	508
1990	508

Figure J-3. In-Migration Sensitivity - Case 2

ESTIMATED TOTAL LICENSED AND ACTIVE DENTISTS IN CALIFORNIA

	1975	1980	1985	1990
TOTAL LIC. DENTISTS	14522	16240	18039	19752
ACTIVE DENTISTS	12529	14012	15564	17042
CALIF.	7747	8652	9992	11076
U.S.	4610	4573	5371	5748
FOREIGN	172	186	201	215
CALIF. POPUL. (THOUSANDS)	21206	22654	24363	26076
ACTIVE DENTISTS/100.000	59	61	63	65

****

CALIFORNIA GRADUATES

YEAR	GRADUATES
1975	471
1976	477
1977	483
1978	489
1979	495
1980	501
1981	508
1982	508
1983	508
1984	508
1985	508
1986	508
1987	508
1988	508
1989	508
1990	508

Figure J-4. In-Migration Sensitivity - Case 3

ESTIMATED TOTAL LICENSED AND ACTIVE DENTISTS IN CALIFORNIA

	1975	1980	1985	1990
TOTAL LIC. DENTISTS	14522	16660	18728	21115
ACTIVE DENTISTS	12525	14375	16311	18718
CALIF.	7747	8753	9671	11398
U.S.	4610	5379	6275	7055
FOREIGN	172	201	233	264
CALIF. POPUL. (THOUSANDS)	21206	22659	24361	28049
ACTIVE DENTISTS/100,000	59	63	67	67

****

CALIFORNIA GRADUATES

YEAR	GRADUATES
1975	471
1976	477
1977	463
1978	469
1979	493
1980	501
1981	508
1982	503
1983	508
1984	508
1985	538
1986	508
1987	508
1988	508
1989	508
1990	508

Figure J-5. California Graduate Retention Sensitivity - Case 4

```
        ESTIMATED TOTAL LICENSED AND ACTIVE DENTISTS IN CALIFORNIA

                                  1975        1980        1985        1990

TOTAL LIC. DENTISTS              14572       16592       18783       20905
ACTIVE DENTISTS                  12535       14310       16311       17337
   CALIF.                         7747        8734        9751       10717
   U.S.                           4616        5375        6329  [illegible]
   FOREIGN                         172         201         231         264
CALIF. POPUL. (THOUSANDS)        21206       22159       24363       25295
ACTIVE DENTISTS/100,000             59          63          65          69

                    ******************************

                    CALIFORNIA GRADUATES

                    YEAR              GRADUATES

                    1975                 471
                    1976                 477
                    1977                 487
                    1978                 497
                    1979                 495
                    1980                 501
                    1981                 505
                    1982                 508
                    1983                 508
                    1984                 508
                    1985                 507
                    1986                 508
                    1987                 508
                    1988                 508
                    1989                 508
                    1990                 501
```

Figure J-6. California Graduate Retention Sensitivity - Case 5

```
              ESTIMATED TOTAL LICENSED AND ACTIVE DENTISTS IN CALIFORNIA

                                    1975          1980          1985          1990

TOTAL LIC. DENTISTS                14327         16794         19391         22121
ACTIVE DENTISTS                    12524         14456         16731         19389
   CALIF.                           7747          8881         10271         11766
   U.S.                             4616          5374          6225          7359
   FOREIGN                           177           201           235           264
CALIF. POPUL. (THOUSANDS)          21206         22659         24337   [illegible]
ACTIVE DENTISTS/100,000               59            63            68            73

                        ******************************

                           CALIFORNIA GRADUATES

                        YEAR                 GRADUATES

                        1975                    471
                        1976                    469
                        1977                    508
                        1978                    527
                        1979                    547
                        1980                    558
                        1981                    583
                        1982                    604
                        1983                    619
                        1984                    634
                        1985                    649
                        1986                    665
                        1987                    681
                        1988                    698
                        1989                    715
                        1990                    732
```

Figure J-7. California Growth Sensitivity - Case 6

```
                    ESTIMATED TOTAL LICENSED AND ACTIVE DENTISTS IN CALIFORNIA

                                     1975          1980          1985          1990

TOTAL LIC. DENTISTS                 14522         17611         20555         23723
ACTIVE DENTISTS                     12524         14677         17633         22354
   CALIF.                            7747          8695         11171         15054
   U.S.                              4616          5779          6225          7355
   FOREIGN                            177           201           211           264
CALIF. POPUL. (THOUSANDS)           21220         22859         24361         26243
ACTIVE DENTISTS/100.000                59            64            73            85

                              ******************************

                                   CALIFORNIA GRADUATES

                              YEAR                GRADUATES

                              1975                   471
                              1976                   525
                              1977                   585
                              1978                   652
                              1979                   727
                              1980                   810
                              1981                   903
                              1982                   993
                              1983                  1092
                              1984                  1201
                              1985                  1321
                              1986                  1453
                              1987                  1598
                              1988                  1757
                              1989                  1932
                              1990                  2125
```

Figure J-8. California Graduate Growth Sensitivity - Case 7

```
              ESTIMATED TOTAL LICENSED AND ACTIVE DENTISTS IN CALIFORNIA

                              1975           1980           1985           1990

TOTAL LIC. DENTISTS          14522          16963          19734          23124
ACTIVE DENTISTS              12529          14550          17357          19951
   CALIF.                     7747           8966          10893          12331
   U.S.                       4610           5379           6225           7355
   FOREIGN                     172            201            239            264
CALIF. POPUL. (THOUSANDS)    21206          22659          24363          26244
ACTIVE DENTISTS/100,000         59             64             69             76

                         ******************************

                            CALIFORNIA GRADUATES

                         YEAR                  GRADUATES

                         1975                     471
                         1976                     501
                         1977                     533
                         1978                     567
                         1979                     603
                         1980                     642
                         1981                     683
                         1982                     717
                         1983                     752
                         1984                     789
                         1985                     828
                         1986                     869
                         1987                     912
                         1988                     957
                         1989                    1004
                         1990                    1054
```

Figure J-9. California Graduate Growth Sensitivity - Case 8

APPENDIX D

Methodology and Base Case for Pharmacist Supply Projections and Migration Analysis

Basic Projection Methodology

In this Appendix the approach used for projecting the number of active licensed pharmacists in California consists of two steps. In the first step, the total future number of licensed pharmacists is estimated, and, in the second, the proportion of these licensed pharmacists actively employed in pharmacy is calculated. The methodology used for accomplishing the first step involves three tasks. First, losses in the current supply of licensed pharmacists due to attrition from death and nonrenewal of licenses are calculated. Second, additions to the supply from the expected flow of in-migrating pharmacists trained outside the state are estimated. Third, additions to this supply from the expected flow of new graduates from California schools are projected. Using this methodology for projecting future licensed pharmacists implies a model reflecting fundamental age-related changes in the career patterns of pharmacists. This model can be expressed symbolically as:

$$PH(t) = \sum_i PH(i,t) \qquad \text{(C-1)}$$

$$APH(t) = \sum_i PH(i,t)P(A|R,i) \qquad \text{(C-2)}$$

$$PH(i,t) = P(i,t)+M(i,t)+G(i,t) \qquad \text{(C-3)}$$

$$P(i,t) = P(i-1,t-1)(1-d(i-1))(1-a(i-1)) \qquad \text{(C-4)}$$

$$M(i,t) = GUS(t-1)PU(i-1)+M(i-1,t-1)(1-d(i-1))(1-a(i-1)) \qquad \text{(C-5)}$$

$$G(i,t) = GC(t-1)PC(i-1)+G(i-1,t-1)(1-d(i-1))(1-a(i-1)) \qquad \text{(C-6)}$$

with

$$PU(i-1) = H \cdot APCU(i-1)(1-d(i-1))(1-a(i-1)) \qquad \text{(C-7)}$$

$$PC(i-1) = P(R|G)APCC(i-1)(1-d(i-1))(1-a(i-1)) \qquad \text{(C-8)}$$

where:

PH(t) = the number of pharmacists licensed and living in California in time period t.

APH(t) = the number of actively employed pharmacists in California in time period t.

P(i,t) = the number of pharmacists of age i licensed and living in California in time period t stemming solely from the stock of pharmacists of year 1975.

P(A|R,i) = the conditional probability that a pharmacist will be active, given that he (or she) is licensed and living in the state and i years old (see Table C-10).

P(i-1,t-1) = the number of pharmacists of age (i-1) licensed and living in California in time period (t-1).

G(i-1,t-1) = the number of graduates from California schools of age (i-1) in time period (t-1).

M(i-1,t-1) = the number of pharmacists graduated from schools in other states of age (i-1) moving to, licensed, and living in California in time period (t-1).

P(R|G) = the conditional probability that registration will occur in California, given that the student has graduated from a California school (see pg. C-8).

d(i-1) = the probability of death for pharmacists of age (i-1) in a given time period (see Table C-1).

a(i-1) = the probability that a pharmacist of age (i-1) will drop his or her license in a given time period (see Table C-1).

M = in-migration rate expressed as a proportion of new U.S. graduates (see pg. C-7).

GUS = estimated U.S. graduates (see Table C-6).

GC = estimated California graduates (see Table C-8).

APCU = estimated age distribution of U.S. graduates who in-migrate to California (see Table C-2).

APCC = estimated age distribution of new graduates of pharmacist training programs in California (see Table C-2).

Attrition Factors

Table C-1 summarizes data on the total current supply of pharmacists licensed and living in California, the age distribution of these pharmacists, the attrition factors for each age group, and the number of those pharmacists estimated as surviving and retaining their licenses in 1980, 1985, and 1990.

The first attrition factor, the probability of survival, is based on death rates for males.

Table C-1. Current Supply of California Pharmacists, Attrition Factors, and Projection after Attrition

Age	1975 P(i,t)*	Probability of Surviving (1-d(i))†	Probability of Remaining in Practice (1-a(i))††	Pharmacists Surviving and Remaining in Practice		
				1980	1985	1990
Under 30	3,795	.9982	1.000	1,414	-	-
30 to 39	2,277	.9978	1.000	3,474	3,719	1,382
40 to 49	2,313	.9945	1.000	2,243	2,194	3,358
50 to 59	2,2[illegible]9	.9858	.995	2,132	2,059	1,996
60 to 64	807	.9733	.933	995	942	896
65+	380	.9515	.959			
Total	11,861**			10,258	8,914	7,632

* Age distribution estimated from reference 15.

** As of 11/4/75; source: California Department of Consumer Affairs.

† Reference 3, pp. 14-15.

†† Estimated from references 14, 15.

National data from references 14 and 15 provided the basis for calculating the second attrition factor, the probability of retaining a license. Starting with the total number of pharmacists in 1969, as shown in reference 14, survival rates were applied, and a new total and age distribution for 1973 were estimated. Using data on new graduates in the period from 1969 to 1972 from reference 4 and a new graduate age distribution, as shown in Table C-2, the number of new graduates for the period by age group was calculated. After applying the survival rates, a new total and age distribution for new graduates surviving in 1973 were estimated and added to the estimated number of 1969 pharmacists surviving in that same year.

Table C-2. Estimated Age Distribution of New Graduates of Pharmacy Training Programs

Age	Proportion
Under 30	.904
30 to 39	.080
40 to 49	.016

Source: INTERPLAN estimate from dentist and physician data.

The sum of the 1969-73 new graduates and the 1969 pharmacists estimated as surviving in 1973, divided by the actual number of 1973 pharmacists (as published in reference 15), provides a measure for the rate of pharmacists by age group who dropped their licenses in the time interval used. Table C-3 contains this rate (see column 6), before being annualized, together with data on pharmacists and new graduates used in the calculations.

Table C-3. Total Number of U.S. Pharmacists, New Graduates, and Probabilities of Remaining Active

Age	(1) Total 1969*	(2) Number Surviving 1973	(3) Surviving New Graduates	(4) (2)+(3)	(5) Total Pharmacists 1973**	(6) (5)÷(4) (1-a(i))*
Under 30	23,319	13,891	13,109	27,000	27,004	1.000
30 to 39	29,949	27,059	5,035	32,094	32,294	1.000
40 to 49	25,459	26,814	473	27,287	28,473	1.000
50 to 59	23,013	23,001	44	23,045	22,553	.979
60 to 64	11,896	15,098	-	15,098	11,434	.757
65+	10,850	13,163	-	13,163	11,141	.846
Total	124,486	119,026	18,661	137,687	132,899	.965

* Reference 14.

** Reference 15.

The Migration Rate

The base period used for estimating the migration rate of pharmacists trained outside the state of California is 1969 to 1973. The approach starts with the total number of pharmacists in the state in 1969. Survival rates were then applied, and a new total and age distribution for 1973 were estimated. Next, the number of California school graduates in the base period surviving in 1973 was estimated.

New graduate data used in calculating the number of new California school graduates for the base period years are contained in Table C-4. The age distribution of these new graduates was estimated to be the same as the age distribution of pharmacy graduates (see Table C-2).

Table C-4. California Pharmacist Graduates

Year	Graduates
1975	416
1974	423
1973	436
1972	307
1971	301
1970	302
1969	235
1968	264
1967	253

Source: Letters from each of the schools of pharmacy in the state.

The number may be overstated because the totals include both B.A. and advanced degrees, and pharmacists who receive both degrees in the period covered are counted twice.

Applying the survival rates and calculating a new total and age distribution for all new graduates between 1969 and 1972 provided an estimate of these new graduates in the base period who survived in 1973. These surviving new graduates were then added, by age group, to the surviving pharmacists of 1969. Finally, the probabilities of retaining licenses shown in Table C-1 were applied to derive an estimate of 1969 pharmacists and new graduates who both survived and retained their licenses in 1973. The difference between this estimate and the actual number of pharmacists in 1973, as shown in reference 15, serves as a measure of the in-migrating pharmacists trained in schools outside the state.

From these results (see Table C-5), it is estimated that 1,038 pharmacists in-migrated to California during the four-year period from 1969 to 1973, for an average of 260 per year. During this same period, there were

Table C-5. Total Number of California Pharmacists, New Graduates, and Migration

	(1) Total Pharmacists 1969*	(2) Number Surviving 1973	(3) Surviving New Graduates 1969-72	Surviving (2)+(3)	Surviving and Active 1973	Actual 1973**	Total In-Migrations (6)-(5)
Under 30	3,000	1,787	889	2,276	2,676		
30 to 39	2,300	2,558	224	2,782	2,782		
40 to 49	2,450	2,349	30	2,379	2,379		
50 to 59	2,400	2,319	2	2,321	2,272		
60 to 64	932	1,409		1,409	1,069		
65+	558	791		791	669		
Total	11,640	11,213	1,145	12,358	11,447	12,485	1,038

* Reference 14.

** Reference 15.

an estimated 130,300 active pharmacists in the nation each year (see reference 4). Thus, the in-migration as a proportion of new graduates, is .0020.

Projecting Migration—Base Case

Using the migration rate and the estimated total number of U.S. graduates between 1976 and 1990 (see Table C-6), future in-migration to the state can be projected. The age distribution of in-migrating pharmacists was estimated to be the same as the age distribution of pharmacy graduates (see Table C-2).

Table C-6. Estimated Number of Active United States Pharmacists

Year	Number
1975	133,800
1976	136,260
1977	138,720
1978	141,180
1979	143,640
1980	146,100
1981	149,240
1982	152,380
1983	155,520
1984	158,660
1985	161,800
1986	165,420
1987	169,040
1988	172,660
1989	176,280
1990	179,900

Source: Estimated from reference 4, p. 101.

Table C-7 shows the estimated total number of pharmacists migrating to California, who will both survive and retain their licenses in 1980, 1985, and 1990, using the methodology described in this appendix.

Table C-7. Estimated Number of Pharmacists Migrating to California Between 1976 and 1990, Using Base Case Migration Rate

	1980	1985	1990
Under 30	790	959	1,064
30 to 39	539	1,754	2,701
40 to 49	47	142	681
50 to 59	-	18	64
60 to 64	-	-	3
65+	-	-	-
Totals	1,376	2,873	4,513

California Graduates

To estimate the number of California graduates between 1976 and 1990, it is assumed that the rate of growth in the number of these graduates will be the same as the rate of growth for the nation, as estimated in reference 4. The annual rate of growth, F(t), for each five year period calculated from the date in Table C-6 is as follows: 1976-80 = .018, 1981-85 = .015, and 1986-90 = .015. Table C-8 shows the estimated number of California graduates by year, using these assumed rates of growth according to equation C-9.

$$GC(t) = GC(t-1) \cdot F(t) \qquad (C\text{-}9)$$

Based on a conversation with the staff of the State Board of Pharmacy, it is assumed that, for the base case projection, the probability that a California graduate will become licensed in California is one, i.e., $P(R|G) = 1$.

To calculate the number of California graduates in the period from 1976 to 1990 who will obtain licenses and both survive and retain licenses, the conditional probability, the survival rates, and the rates for the probability of retaining a license were applied to the estimated number of graduates. The age distribution of the graduates used in these calculations is shown in Table C-2. Table C-9 contains the estimated number of new California graduates who will be pharmacists in California in 1980, 1985, and 1990, using the methodology described in this appendix.

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Table C-8. California Pharmacy Graduates, Base Case Projection—1976 to 1990

Year	Estimated Number of California Graduates
1975	416
1976	423
1977	430
1978	437
1979	444
1980	451
1981	457
1982	463
1983	469
1984	476
1985	483
1986	490
1987	497
1988	504
1989	511
1990	518

Table C-9. Estimated Number of California Graduates between 1976 and 1990—Base Case

Age	1980	1985	1990
Under 30	1,217	1,459	1,565
30 to 39	836	2,701	4,098
40 to 49	74	219	1,049
50 to 59	6	28	98
60 to 64	-	-	5
65+	-	-	-
Totals	2,133	4,407	6,815

Active Pharmacists

The final step in projecting the number of active pharmacists in the state is to apply the conditional probability that a licensed pharmacist will be active to the total number of licensed pharmacists in each age group. The values for this conditional probability, $P(A|R,i)$, calculated from the actual 1972 proportion of active pharmacists in each age group, are shown in Table C-10.* These values were obtained from reference 15.

Table C-10. Conditional Probability that a Licensed California Pharmacist in Age Group i is Active

Age	$P(A\|R,i)$
Under 30	.87
30 to 39	.87
40 to 49	.87
50 to 59	.87
60 to 64	.87
65+	.87

The resultant estimated number of active pharmacists in California in 1975, 1980, 1985, and 1990 is shown in Table C-11. This table also contains the total number of pharmacists who are licensed and living in the state in those years and the number and percentage of pharmacists who are surviving 1975 pharmacists, who will be migrating to California between 1976 and 1990, or who will be graduating from California pharmacist programs between 1976 and 1990. The bottom line of the table lists the number of active pharmacists per 100,000 persons. The estimates of the future number of active pharmacists in California are analyzed and evaluated in the section on pharmacists in the body of this report.

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* Data on activity, status by age group, was not available in the preparation of this report. Applying the same value to every age group is equivalent to using a single value for all pharmacists.

Table C-11. Base Case Estimated Total Number of Licensed and Active Pharmacists in California in 1975, 1980, 1985, and 1990

	1975		1980		1985		1990	
	Number	%	Number	%	Number	%	Number	%
Total Number of Licensed Pharmacists	11,861		13,769		16,195		18,961	
Active Pharmacists	10,319		11,979	100.0	14,090	100.0	16,496	100.0
Surviving and Licensed 1975 Pharmacists	-		8.926	74.5	7,757	55.1	6,641	40.3
Migrating Pharmacists, 1976-1990	-		1,197	10.0	2,499	17.7	3,926	23.8
California Graduates 1976-1990	-		1,856	15.5	3,834	27.2	5,929	35.9
California Population (thousands)*	21,206		22,659		24,363		26,098	
Active Pharmacists per 100,000	48		52		57		63	

Source: reference 7.

APPENDIX D

Sensitivity Analysis of Future California Pharmacist Supply

In this appendix results of the sensitivity analyses on the key parameters of the Pharmacist supply model are reported and compared to the base case projection described in Appendix C. In this sensitivity analysis, changes in the values of the in-migration factor, H, the retention probability of California graduates, P(R|G), and the growth rate for California graduates, F, were considered. A summary of the values considered and the impacts on the Pharmacist to population ratio are shown in Table H-1. Figures H-2 to H-9 contain the computer print-outs for each of the cases identified in the summary table.

Table H-1. Pharmacist Sensitivity Analysis Summary

	In-Migration Parameter		California Graduate Retention		California Graduates Growth Rates					
					F(t) Values					
	M Value	Percentage of Change	P(R|G) Value	Percentage of Change	1975-80	1980-85	1985-90	Percentage of Change	1985 Pharmacists per 100,000	Percentage of Change
Base Case	.0020	-0-	1.0	-0-	.018	.015	.015	-0-	57	-0-
In-Migration Sensitivity										
Case 1	.0018	-10%	1.0	-0-	.018	.015	.015	-0-	56	-.018
2	.0015	-25%	1.0	-0-	.018	.015	.015	-0-	55	-.035
3	.0010	-50%	1.0	-0-	.018	.015	.015	-0-	52	-.088
California Graduate Retention Sensitivity										
Case 4	.0020	-0-	.95	- 5%	.018	.015	.015	-0-	57	0.0
5	.0020	-0-	.90	-10%	.018	.015	.015	-0-	56	-.018
California Graduate Growth Sensitivity										
Case 6	.0020	-0-	1.0	-0-	.0185	.0154	.0154	+ 2.5%	59	+.035
7	.0020	-0-	1.0	-0-	.0190	.0158	.0158	+ 5.0%	62	+.088
8	.0020	-0-	1.0	-0-	.0198	.0165	.0165	+10.0%	67	+.176

```
            ESTIMATED TOTAL LICENSED AND ACTIVE PHARMACISTS IN CALIFORNIA

                                       1975         1980         1985         1990

TOTAL LIC. PHARMACISTS                11861        13631        15908        18510
ACTIVE PHARMACISTS                    10319        11859        13640        16103
   PHARMACISTS FROM 1975 STOCK            0         8925         7755         6640
   MIGRATING PHARMACISTS                  0         1078         2249         3533
   CALIF. GRADUATES 1976-1990             0         1856         3834         5929
CALIF. POPUL. (THOUSANDS)             21206        22659        24363        26098
ACTIVE PHARM. PER 100.000                48           52           56           61

                          ********************************

                              CALIFORNIA GRADUATES

                          YEAR                GRADUATES

                          1975                   416
                          1976                   423
                          1977                   430
                          1978                   437
                          1979                   444
                          1980                   451
                          1981                   457
                          1982                   463
                          1983                   469
                          1984                   476
                          1985                   483
                          1986                   490
                          1987                   497
                          1988                   504
                          1989                   511
                          1990                   518
```

Figure H-2. In-Migration Sensitivity - Case 1

ESTIMATED TOTAL LICENSED AND ACTIVE PHARMACISTS IN CALIFORNIA

	1975	1980	1985	1990
TOTAL LIC. PHARMACISTS	11861	13425	15477	17833
ACTIVE PHARMACISTS	10319	11679	13465	15515
PHARMACISTS FROM 1975 STOCK	0	8925	7755	6640
MIGRATING PHARMACISTS	0	898	1874	2944
CALIF. GRADUATES 1976-1990	0	1856	3834	5929
CALIF. POPUL. (THOUSANDS)	21206	22659	24363	26058
ACTIVE PHARM. PER 100.000	48	51	55	59

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CALIFORNIA GRADUATES

YEAR	GRADUATES
1975	416
1976	423
1977	430
1978	437
1979	444
1980	451
1981	457
1982	463
1983	469
1984	476
1985	483
1986	490
1987	497
1988	504
1989	511
1990	518

Figure H-3. In-Migration Sensitivity - Case 2

```
                 ESTIMATED TOTAL LICENSED AND ACTIVE PHARMACISTS IN CALIFORNIA

                                   1975          1980          1985          1990

TOTAL LIC. PHARMACISTS            11861         13080         14759         16705
ACTIVE PHARMACISTS                10319         11380         12840         14533
   PHARMACISTS FROM 1975 STOCK        0          8925          7755          6640
   MIGRATING PHARMACISTS              0           598          1249          1963
   CALIF. GRADUATES 1976-1990         0          1856          3834          5929
CALIF. POPUL. (THOUSANDS)         21206         22659         24363         26098
ACTIVE PHARM. PER 100.000            48            50            52            55

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                                  CALIFORNIA GRADUATES

                              YEAR                GRADUATES

                              1975                   416
                              1976                   423
                              1977                   430
                              1978                   437
                              1979                   444
                              1980                   451
                              1981                   457
                              1982                   463
                              1983                   469
                              1984                   476
                              1985                   483
                              1986                   490
                              1987                   497
                              1988                   504
                              1989                   511
                              1990                   518
```

Figure H-4. In-Migration Sensitivity - Case 3

ESTIMATED TOTAL LICENSED AND ACTIVE PHARMACISTS IN CALIFORNIA

	1975	1980	1985	1990
TOTAL LIC. PHARMACISTS	11861	13662	15975	18620
ACTIVE PHARMACISTS	10319	11866	13898	16200
PHARMACISTS FROM 1975 STOCK	0	8925	7755	6640
MIGRATING PHARMACISTS	0	1197	2459	3926
CALIF. GRADUATES 1976-1990	0	1763	3643	5633
CALIF. POPUL. (THOUSANDS)	21206	22659	24363	26098
ACTIVE PHARM. PER 100.000	48	52	57	62

****

CALIFORNIA GRADUATES

YEAR	GRADUATES
1975	416
1976	423
1977	430
1978	437
1979	444
1980	451
1981	457
1982	463
1983	469
1984	476
1985	483
1986	490
1987	497
1988	504
1989	511
1990	518

Figure H-5. California Graduate Retention Sensitivity - Case 4

ESTIMATED TOTAL LICENSED AND ACTIVE PHARMACISTS IN CALIFORNIA

	1975	1980	1985	1990
TOTAL LIC. PHARMACISTS	11861	13556	15755	18280
ACTIVE PHARMACISTS	10319	11793	13706	15903
PHARMACISTS FROM 1975 STOCK	0	8925	7755	6640
MIGRATING PHARMACISTS	0	1197	2499	3926
CALIF. GRADUATES 1976-1990	0	1670	3451	5336
CALIF. POPUL. (THOUSANDS)	21206	22659	24363	26098
ACTIVE PHARM. PER 100.000	48	52	56	60

****

CALIFORNIA GRADUATES

YEAR	GRADUATES
1975	416
1976	423
1977	430
1978	437
1979	444
1980	451
1981	457
1982	463
1983	469
1984	476
1985	483
1986	490
1987	497
1988	504
1989	511
1990	518

Figure H-6. California Graduate Retention Sensitivity - Case 5

ESTIMATED TOTAL LICENSED AND ACTIVE PHARMACISTS IN CALIFURNIA

	1975	1980	1985	1990
TOTAL LIC. PHARMACISTS	11861	13882	16758	20396
ACTIVE PHARMACISTS	10319	12078	14580	17745
PHARMACISTS FROM 1975 STOCK	0	8925	7755	6640
MIGRATING PHARMACISTS	0	1197	2499	3926
CALIF. GRADUATES 1976-1990	0	1955	4324	7178
CALIF. POPUL. (THOUSANDS)	21206	22659	24363	26098
ACTIVE PHARM. PER 100,000	49	53	59	67

****

CALIFORNIA GRADUATES

YEAR	GRADUATES
1975	416
1976	434
1977	452
1978	471
1979	491
1980	512
1981	532
1982	553
1983	575
1984	598
1985	622
1986	647
1987	673
1988	700
1989	728
1990	757

Figure H-7. California Graduate Growth Sensitivity - Case 6

```
          ESTIMATED TOTAL LICENSED AND ACTIVE PHARMACISTS IN CALIFORNIA

                                   1975       1980       1985       1990

TOTAL LIC. PHARMACISTS            11861      13998      17383      22132
ACTIVE PHARMACISTS                10319      12178      15123      19255
   PHARMACISTS FROM 1975 STOCK        0       8925       7755       6640
   MIGRATING PHARMACISTS              0       1197       2499       3926
   CALIF. GRADUATES 1976-1990         0       2055       4868       8688
CALIF. POPUL. (THOUSANDS)         21206      22659      24363      26098
ACTIVE PHARM. PER 100.000            48         53         62         73

                    ******************************

                        CALIFORNIA GRADUATES

                    YEAR               GRADUATES

                    1975                  416
                    1976                  444
                    1977                  474
                    1978                  506
                    1979                  540
                    1980                  577
                    1981                  614
                    1982                  654
                    1983                  697
                    1984                  742
                    1985                  790
                    1986                  841
                    1987                  896
                    1988                  954
                    1989                 1016
                    1990                 1082
```

Figure H-8. California Graduate Retention Sensitivity - Case 7

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              ESTIMATED TOTAL LICENSED AND ACTIVE PHARMACISTS IN CALIFORNIA

                                       1975          1980          1985          1990

TOTAL LIC. PHARMACISTS                11861         14250         18925         27071
ACTIVE PHARMACISTS                    10319         12398         16465         23552
   PHARMACISTS FROM 1975 STOCK            0          8925          7755          6640
   MIGRATING PHARMACISTS                  0          1197          2499          3926
   CALIF. GRADUATES 1976-1990             0          2275          6209         12985
CALIF. POPUL. (THOUSANDS)             21206         22659         24363         26058
ACTIVE PHARM. PER 100.000                48            54            67            90

                         ******************************

                              CALIFORNIA GRADUATES

                         YEAR                GRADUATES

                         1975                   416
                         1976                   465
                         1977                   520
                         1978                   582
                         1979                   651
                         1980                   728
                         1981                   812
                         1982                   906
                         1983                  1011
                         1984                  1128
                         1985                  1259
                         1986                  1405
                         1987                  1568
                         1988                  1750
                         1989                  1953
                         1990                  2180
```

Figure H-9. California Graduate Growth Sensitivity - Case 8

APPENDIX D

Methodology and Base Case for Optometrist Supply Projections and Migration Analysis

Basic Projection Methodology

In this appendix the approach used for projecting the number of active licensed optometrists in California consists of two steps. In the first step, the total future number of licensed optometrists is estimated. In the second, the proportion of these licensed optometrists actively employed in optometry is calculated. The methodology used for accomplishing the first step involves three tasks. First, losses in the current supply of licensed optometrists due to attrition from death and nonrenewal of licenses are calculated. Second, additions to the supply from the expected flow of in-migrating optometrists trained outside the state are estimated. Third, additions to this supply from the expected flow of new graduates from California schools are projected. Using this methodology to project the future number of licensed optometrists implies a model reflecting fundamental age-related changes in the career patterns of optometrists. This model can be expressed symbolically as:

$$OP(t) = \sum_{i} OP(i,t) \tag{B-1}$$

$$AOP(t) = \sum_{i} OP(i,t)P(A|R,i) \tag{B-2}$$

$$OP(i,t) = O(i,t) + M(i,t) + G(i,t) \tag{B-3}$$

$$O(i,t) = O(i-1,t-1)(1-d(i-1))(1-a(i-1)) \tag{B-4}$$

$$M(i,t) = GUS(t-1)PU(i-1)+M(i-1,t-1)(1-d(i-1))(1-a(i-1)) \tag{B-5}$$

$$G(i,t) = GC(t-1)PC(i-1)+G(i-1,t-1)(1-d(i-1))(1-a(i-1)) \tag{B-6}$$

with

$$PU(i-1) = M \cdot APCU(i-1)(1-d(i-1))(1-a(i-1)) \tag{B-7}$$

$$PC(i-1) = P(R|G)APCC(i-1)(1-d(i-1))(1-a(i-1)) \tag{B-8}$$

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where:

$OP(t)$ = the number of optometrists licensed and living in California in time period t.

$AOP(t)$ = the number of actively employed optometrists in California in time period t.

$O(i,t)$ = the number of optometrists of age i licensed and living in California in time period t stemming solely from the stock of optometrists of year 1975.

$PA|R,i)$ = the conditional probability that an optometrist will be active, given that he (or she) is licensed and living in the state and i years old (see Table B-9).

$O(i-1,t-1)$ = the number of optometrists of age (i-1) licensed and living in California in time period (t-1).

$G(i-1,t-1)$ = the number of graduates from California schools of age (i-1) in time period (t-1).

$M(i-1,t-1)$ = the number of optometrists graduated from schools in other states of age (i-1) moving to, licensed, and living in California in time period (t-1).

$P(R|G)$ = the conditional probability that registration will occur in California, given that the student has graduated from a California school (see Table B-2).

$d(i-1)$ = the probability of death for optometrists of age (i-1) in a given time period (see Table B-1).

$a(i-1)$ = the probability that an optometrist of age (i-1) will drop his or her license in a given time period (see Table B-1).

H = in-migration rate expressed as a proportion of new U.S. graduates (see pg. B-3).

GUS = estimated number of U.S. graduates less base case California graduates (see Table B-6).

GC = estimated number of California graduates (see Table B-6).

$APCU$ = estimated age distribution of U.S. graduates who in-migrate to California (see Table B-7).

$APCC$ = estimated age distribution of new graduates of optometrist training programs in California (see Table B-7).

Attrition Factors

Table B-1 summarizes data on the total current supply of optometrists licensed and living in California, the age distribution of these optometrists, the attrition factor, the probability of survival, is based on death rates for males. An analysis of data from references 8 through 11 indicate that few, if any, surviving optometrists dropped their licenses. Thus, for the base case analysis, the values of the second attrition factor in Table B-1 are all set equal to one.

Table B-1. Current Supply of California Optometrists, Attrition Factors, and Projection after Attrition

Age	1975 OP(i,t)*	Probability of Surviving (1-d(i))†	Probability of Retaining License (1-a(i))††	Optometrists Surviving and Retaining Licenses		
				1980	1985	1990
Under 30	304	.9982	1.00	114	-	-
30 to 39	496	.9978	1.00	435	299	111
40 to 49	747	.9945	1.00	606	478	419
50 to 59	766	.9858	1.00	714	679	549
60 to 69	240	.9667	1.00	442	609	567
70+	135	.9428	1.00	20	17	51
Total	2,988**			2,592	2,314	1,887

* Age distribution estimated from reference 8, p. 8.

** As of December 1975; source: California Department of Consumer Affairs and reference 12.

† Death rates are those for males taken from reference 3, pp. 8-9.

†† Estimated from references 8, 9, 10, and 11.

The Migration Rate

A study of California optometric manpower in 1969 (reference 13) found that between 1955 and 1969 an average of 15.6 optometrists in-migrated to California each year. The estimated number of non-California optometry school graduates per year over this period was 308. Thus, the in-migration rate of optometrists trained outside the state to California, expressed as a proportion of optometrists graduated outside the state, is (15.6/308)=.0506.

The Retention Rate

In reference 13 it was found that the state of residence at the time of graduation largely determined the subsequent state of practice. Of the 630 graduates of the Southern College of Optometry between 1960 and 1974, 130 were non-California residents at graduation, while 125 were currently residents of the state.

Based on these findings, the probability that a California graduate will practice in the state of California is equal to the probability that the graduate is a resident of California. Using data from the 1970 to 1974 period, the probability of retention, $P(R|G)$, equals .818. The data for this estimate are shown in Table B-2. The number of graduates by year are shown in Table B-3.

Table B-2. Proportion of California Residents Graduated from California Schools of Optometry: 1970 to 1974.

School	Number of Graduates	California Residents	$P(R\|G)$
Southern California College of Optometry	278	206	
University of California at Berkeley	223	204	
1970-74 Total	501	410	.818

Source: reference 13, pp. 44, 46.

Table B-3. Graduates of California Schools of Optometry

Year	Southern California College of Optometry	University of California at Berkeley	Total
1970	49	39	88
1971	52	33	85
1972	59	51	110
1973	57	44	101
1974	61	56	117
1975	58	53	111

Source: reference 13.

Projecting California Graduates—Base Case

To estimate the number of California graduates between 1976 and 1990, it is assumed that the rate of growth in the number of these graduates will be the same as the rate of growth for the nation, as estimated in reference 4 (see Table B-6). The annual rate of growth, F(t), for each five year period calculated from the data in Table B-6 is as follows: 1976-80 = .0262, 1981-85 = .0340, and 1986-90 = .0340. Table B-4 shows the estimated number of California graduates by year, using these assumed rates of growth according to equation B-9:

$$GC(t) = GC(t-1) \cdot F(t) \qquad (B-9).$$

Table B-4. California Graduates, Base Case Projection—1975 to 1990

Year	Estimated California Graduates
1975	111
1976	113
1977	115
1978	118
1979	121
1980	124
1981	128
1982	132
1983	136
1984	140
1985	144
1986	148
1987	153
1988	158
1989	163
1990	168

To calculate the number of California graduates in the period from 1976 to 1990 who will obtain licenses and both survive and retain licenses, the retention probability P(R|G), the survival rates (1-d(i)), and the rates for the probability of retaining a license (1-a(i)) were applied to the estimated number of graduates. The age distribution of the graduates used in these calculations is shown in Table B-7. Table B-5 contains the estimated number of new California graduates who will be optometrists in 1980, 1985, and 1990, using the methodology described in this appendix.

Table B-5. Estimated Number of New California Graduates Between 1976 and 1990—Base Case

Age	1980	1985	1990
Under 30	269	341	394
30 to 39	183	603	957
40 to 49	16	49	234
50 to 59	1	6	22
60 to 69	-	-	1
70+	-	-	-
Total	469	999	1,608

Projecting Migration—Base Case

Using the migration rate and the estimated total number of U.S. graduates outside California between 1976 and 1990 (see Table B-6), future in-migration to the state can be projected. The age distribution of in-migrating optometrists was estimated to be the same as the age distribution of optometry graduates (see Table B-7).

Table B-6. Projected Number of Graduates of Optometry Schools

Year	Total U.S. Graduates	California Graduates	Non-California Graduates
1976	891	113	778
1977	904	115	789
1978	924	118	806
1979	956	121	835
1980	988	124	864
1981	1,022	128	894
1982	1,057	132	925
1983	1,093	136	957
1984	1,130	140	990
1985	1,168	144	1,024
1986	1,208	148	1,060
1987	1,249	153	1,096
1988	1,292	158	1,134
1989	1,336	163	1,173
1990	1,381	168	1,213

Source: reference 4 and Table B-3.

Table B-7. Estimated Age Distribution of Optometry Graduates

Age	Proportion
Under 30	.904
30 to 39	.080
40 to 49	.016

Source: estimated by INTERPLAN from dentist and physician data.

Table B-8 shows the estimated total number of optometrists migrating to California who will both survive and retain their licenses in 1980, 1985, and 1990, using the methodology described in this appendix.

Table B-8. Estimated Optometrists Migrating to California Between 1976 and 1990, Using Base Case Migration Rate

	1980	1985	1990
Under 30	120	147	179
30 to 39	76	259	419
40 to 49	-	20	98
50 to 59	-	-	-
60 to 69	-	-	-
70+	-	-	-
Total	196	426	696

Active Optometrists

The final step in projecting the number of active optometrists in the state is to apply the conditional probability that a licensed optometrist will be active to the total number of licensed optometrists in each age group. The values for this conditional probability, $P(A|R,i)$, calculated from the actual 1973 proportion of active optometrists in each age group, are shown in Table B-9.

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Table B-9. Conditional Probability that a Licensed California Optometrist in Age Group i is Active

Age	P(A|R,i)
Under 30	.951
30 to 39	.966
40 to 49	.899
50 to 59	.891
60 to 69	.749
70+	.535

Source: reference 8, p. 8.

The resultant estimated number of active optometrists in California in 1975, 1980, 1985, and 1990 is shown in Table B-10. This table also contains the total number of optometrists licensed and living in the state in these years and the number and percentage of active optometrists who are surviving 1975 optometrists, who will be migrating to California between 1976 and 1990, or who will be graduating from California optometry training programs between 1976 and 1990. The bottom line of the table lists the number of active optometrists per 100,000 persons. The estimates of the future number of active optometrists in California are analyzed and evaluated in the section on optometrists in the body of this report.

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Table B-10. Base Case Estimated Total of Licensed and Active Optometrists in California in 1975, 1980, 1985, and 1990.

	1975		1980		1985		1990	
	Number	%	Number	%	Number	%	Number	%
Total Licensed Optometrists	2,988		3,257		3,741		4,193	
Active Optometrists	639		2,916	100.0	3,353	100.0	3,778	100.0
Surviving and Licensed 1975 Optometrists	-		2,280	76.3	1,988	56.7	1,584	39.4
Migrating Optometrists	-		187	7.0	408	13.0	663	18.3
California Graduates 1976-1990	-		449	16.7	956	30.3	1,530	42.3
California Population (thousand)*	21,206		22,659		24,363		26,098	
Active Optometrists per 100,000	12		12		13		14	

Source: reference 7.

APPENDIX D

Sensitivity Analysis of Future California Optometrist Supply

In this appendix results of the sensitivity analyses on the key parameters of the optometrist supply model are reported and compared to the base case projection described in Appendix B. In this sensitivity analysis, changes in the values of the in-migration factor, H, the retention probability of California graduates, P(R|G), and the growth rate for California graduates, F, were considered. A summary of the values considered and the impacts on the optometrist to population ratio are shown in Table G-1. Figures G-2 to G-9 contain the computer print-outs for each of the cases identified in the summary table.

Table G-1. Optometrist Sensitivity Analysis Summary

	In-Migration Parameter		California Graduate Retention		California Graduates Growth Rates F(t) Values				1985 Optometrists per 100,000	
	H Value	Percentage of Change	P(R|G) Value	Percentage of Change	1975-80	1980-85	1985-90	Percentage of Change		Percentage of Change
Base Case	.0506	-0-	.818	-0-	.0262	.0340	.0340	-0-	13	-0-
In-Migration Sensitivity										
Case 1	.0455	-10%	.818	-0-	.0262	.0340	.0340	-0-	13	0.0%
2	.0379	-25%	.818	-0-	.0262	.0340	.0340	-0-	13	0.0%
3	.0253	-50%	.818	-0-	.0262	.0340	.0340	-0-	12	-8.2%
California Graduate Retention Sensitivity										
Case 4	.056	-0-	.777	- 5%	.0262	.0340	.0340	-0-	13	0.0%
5	.056	-0-	.736	-10%	.0262	.0340	.0340	-0-	13	0.0%
California Graduate Growth Sensitivity										
Case 6	.056	-0-	.818	-0-	.0269	.0349	.0349	+ 2.5%	14	8.3%
7	.056	-0-	.818	-0-	.0275	.0357	.0357	+ 5.0%	14	16.7%
8	.056	-0-	.818	-0-	.0288	.0374	.0374	+10.0%	16	25.0%

ESTIMATED TOTAL LICENSED AND ACTIVE OPTOMETRISTS IN CALIFORNIA

	1975	1980	1985	1990
TOTAL LIC. OPTOMETRISTS	2987	3238	3698	4123
ACTIVE OPTOMETRISTS	2639	2897	3312	3711
OPTOMETRISTS FROM 1975 STOCK	0	2280	1988	1584
MIGRATING OPTOMETRISTS	0	168	367	596
CALIF. GRADUATES 1976-1990	0	448	956	1530
CALIF. POPUL. (THOUSANDS)	21206	22659	24363	26098
ACTIVE OPTOM. PER 100.000	12	12	13	14

****

CALIFORNIA GRADUATES

YEAR	GRADUATES
1975	111
1976	113
1977	115
1978	118
1979	121
1980	124
1981	128
1982	132
1983	136
1984	140
1985	144
1986	148
1987	153
1988	158
1989	163
1990	168

Figure G-2. In-Migration Sensitivity - Case 1

```
       ESTIMATED TOTAL LICENSED AND ACTIVE OPTOMETRISTS IN CALIFORNIA

                                        1975          1980          1985          1990

TOTAL LIC. OPTOMETRISTS                 2987          3208          3633          4018
ACTIVE OPTOMETRISTS                     2639          2869          3251          3612
   OPTOMETRISTS FROM 1975 STOCK            0          2280          1988          1584
   MIGRATING OPTOMETRISTS                  0           140           306           496
   CALIF. GRADUATES 1976-1990              0           448           956          1530
CALIF. POPUL. (THOUSANDS)              21206         22659         24363         26098
ACTIVE OPTOM. PER 100.000                 12            12            13            13

                                 ********************************

                                      CALIFORNIA GRADUATES

                                 YEAR                     GRADUATES

                                 1975                        111
                                 1976                        113
                                 1977                        115
                                 1978                        118
                                 1979                        121
                                 1980                        124
                                 1981                        128
                                 1982                        132
                                 1983                        136
                                 1984                        140
                                 1985                        144
                                 1986                        148
                                 1987                        153
                                 1988                        158
                                 1989                        163
                                 1990                        168
```

Figure G-3. In-Migration Sensitivity - Case 2

ESTIMATED TOTAL LICENSED AND ACTIVE OPTOMETRISTS IN CALIFORNIA

	1975	1980	1985	1990
TOTAL LIC. OPTOMETRISTS	2987	3159	3527	3844
ACTIVE OPTOMETRISTS	2639	2822	3149	3447
OPTOMETRISTS FROM 1975 STOCK	0	2280	1988	1584
MIGRATING OPTOMETRISTS	0	93	204	331
CALIF. GRADUATES 1976-1990	0	448	956	1530
CALIF. POPUL. (THOUSANDS)	21206	22659	24363	26098
ACTIVE OPTOM. PER 100.000	12	12	12	13

****

CALIFORNIA GRADUATES

YEAR	GRADUATES
1975	111
1976	113
1977	115
1978	118
1979	121
1980	124
1981	128
1982	132
1983	136
1984	140
1985	144
1986	148
1987	153
1988	158
1989	163
1990	168

Figure G-4. In-Migration Sensitivity - Case 3

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          ESTIMATED TOTAL LICENSED AND ACTIVE OPTOMETRISTS IN CALIFORNIA

                                     1975          1980          1985          1990

TOTAL LIC. OPTOMETRISTS              2987          3234          3690          4112
ACTIVE OPTOMETRISTS                  2639          2894          3305          3701
   OPTOMETRISTS FROM 1975 STOCK         0          2280          1988          1584
   MIGRATING OPTOMETRISTS               0           187           408           663
   CALIF. GRADUATES 1976-1990           0           425           908          1453
CALIF. POPUL. (THOUSANDS)           21206         22659         24363         26098
ACTIVE OPTOM. PER 100.000              12            12            13            14

                        ******************************

                            CALIFORNIA GRADUATES

                        YEAR                 GRADUATES

                        1975                    111
                        1976                    113
                        1977                    115
                        1978                    118
                        1979                    121
                        1980                    124
                        1981                    128
                        1982                    132
                        1983                    136
                        1984                    140
                        1985                    144
                        1986                    148
                        1987                    153
                        1988                    158
                        1989                    163
                        1990                    168
```

Figure G-5. California Graduate Retention Sensitivity - Case 4

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        ESTIMATED TOTAL LICENSED AND ACTIVE OPTOMETRISTS IN CALIFORNIA

                                   1975          1980          1985          1990

TOTAL LIC. OPTOMETRISTS            2987          3210          3640          4032
ACTIVE OPTOMETRISTS                2639          2871          3257          3625
   OPTOMETRISTS FROM 1975 STOCK       0          2280          1988          1584
   MIGRATING OPTOMETRISTS             0           187           408           663
   CALIF. GRADUATES 1976-1990         0           403           860          1377
CALIF. POPUL. (THOUSANDS)         21206         22659         24363         26098
ACTIVE OPTOM. PER 100.000            12            12            13            13

                        ********************************

                              CALIFORNIA GRADUATES

                        YEAR                  GRADUATES

                        1975                     111
                        1976                     113
                        1977                     115
                        1978                     118
                        1979                     121
                        1980                     124
                        1981                     128
                        1982                     132
                        1983                     136
                        1984                     140
                        1985                     144
                        1986                     148
                        1987                     153
                        1988                     158
                        1989                     163
                        1990                     168
```

Figure G-6. California Graduate Retention Sensitivity - Case 5

ESTIMATED TOTAL LICENSED AND ACTIVE OPTOMETRISTS IN CALIFORNIA

	1975	1980	1985	1990
TOTAL LIC. OPTOMETRISTS	2987	3284	3867	4536
ACTIVE OPTOMETRISTS	2639	2942	3474	4106
OPTOMETRISTS FROM 1975 STOCK	0	2260	1988	1584
MIGRATING OPTOMETRISTS	0	167	408	663
CALIF. GRADUATES 1976-1990	0	473	1077	1857
CALIF. POPUL. (THOUSANDS)	21206	22659	24363	26098
ACTIVE OPTOM. PER 100.000	12	12	14	15

****

CALIFORNIA GRADUATES

YEAR	GRADUATES
1975	111
1976	116
1977	122
1978	128
1979	134
1980	140
1981	148
1982	156
1983	165
1984	174
1985	184
1986	195
1987	206
1988	218
1989	231
1990	244

Figure G-7. California Growth Sensitivity - Case 6

```
              ESTIMATED TOTAL LICENSED AND ACTIVE OPTOMETRISTS IN CALIFORNIA

                                     1975          1980          1985          1990

TOTAL LIC. OPTOMETRISTS              2987          3309          4012          4967
ACTIVE OPTOMETRISTS                  2639          2966          3613          4518
   OPTOMETRISTS FROM 1975 STOCK         0          2280          1988          1584
   MIGRATING OPTOMETRISTS               0           187           408           663
   CALIF. GRADUATES 1976-1990           0           497          1216          2270
CALIF. POPUL. (THOUSANDS)           21206         22659         24363         26098
ACTIVE OPTOM. PER 100.000              12            13            14            17

                              ****************************

                                  CALIFORNIA GRADUATES

                              YEAR                 GRADUATES

                              1975                    111
                              1976                    119
                              1977                    128
                              1978                    137
                              1979                    147
                              1980                    158
                              1981                    171
                              1982                    185
                              1983                    200
                              1984                    217
                              1985                    235
                              1986                    255
                              1987                    276
                              1988                    299
                              1989                    324
                              1990                    351
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Figure G-8. California Graduate Growth Sensitivity - Case 7

ESTIMATED TOTAL LICENSED AND ACTIVE OPTOMETRISTS IN CALIFORNIA

	1975	1980	1985	1990
TOTAL LIC. OPTOMETRISTS	2987	3369	4388	6241
ACTIVE OPTOMETRISTS	2639	3022	3972	5735
OPTOMETRISTS FROM 1975 STOCK	0	2280	1988	1584
MIGRATING OPTOMETRISTS	0	187	408	663
CALIF. GRADUATES 1976-1990	0	554	1575	3487
CALIF. POPUL. (THOUSANDS)	21206	22659	24363	26098
ACTIVE OPTOM. PER 100.000	12	13	16	21

****

CALIFORNIA GRADUATES

YEAR	GRADUATES
1975	111
1976	125
1977	141
1978	159
1979	179
1980	202
1981	229
1982	260
1983	295
1984	335
1985	381
1986	433
1987	492
1988	559
1989	635
1990	722

Figure G-9. California Graduate Growth Sensitivity - Case 8

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APPENDIX E

JOB OPPORTUNITIES FROM INDUSTRIAL CHANGE AND REPLACEMENT NEEDS--California 1975-1980

Occupational Category	Net Demand From Industry Change	Replacement Needs Due to Labor Force Separations	Total Job Opportunities From These Sources	Avg Annual Job Opportunities	Job Opportunity Ratio
Dentists	2611	2560	5171	1034	6.30
Optometrists	1207	625	1832	366	9.17
Pharmacists	1067	1954	3021	604	5.44
Physicians and Osteopaths	6711	7292	14003	2801	5.85
Registered Nurses	14770	31303	46073	9215	8.53

SOURCE: Employment Development Department, Sacramento, December 1975.

JOB OPPORTUNITIES FROM INDUSTRIAL CHANGE & REPLACEMENT NEEDS FOR SELECTED HEALTH PROFESSIONALS IN NORTHERN CALIFORNIA S.M.S.A.'S*, 1975-80

S.M.S.A.	Occupation	Net Demand from Industry Change	Replacement Needs Due to Labor Force Separations	Total Job Opportunities	Average Annual Job Opportunities	Job Opportunities** Ratio
Fresno:	Physicians	247	134	381	76	9.28
	Nurses	464	615	1079	216	10.61
	Dentists	88	44	132	26	10.12
	Optometrists	124	34	158	32	16.72
	Pharmacists	14	33	47	9	4.95
Monterey:	Physicians	82	70	152	30	6.71
	Nurses	221	321	542	108	10.11
	Dentists	46	36	82	16	7.32
	Optometrists	15	7	22	4	10.35
	Pharmacists	13	16	29	6	6.36
Sacramento:	Physicians	308	263	571	114	6.73
	Nurses	574	1099	1673	335	8.88
	Dentists	191	99	290	58	9.84
	Optometrists	87	37	124	25	10.82
	Pharmacists	41	77	118	24	5.38
San Francisco/ Oakland:	Physicians	890	1454	2344	469	4.80
	Nurses	1484	5056	6540	1308	7.31
	Dentists	740	597	1337	267	7.10
	Optometrists	274	108	382	76	11.64
	Pharmacists	144	359	503	101	4.87
San Joaquin:	Physicians	81	91	172	34	5.73
	Nurses	217	493	710	142	8.31
	Dentists	16	35	51	10	4.31
	Optometrists	21	12	33	7	8.87
	Pharmacists	67	78	145	29	6.73
San Jose:	Physicians	421	450	871	174	5.89
	Nurses	1308	1989	3297	659	9.87
	Dentists	322	185	507	101	9.07
	Optometrists	103	47	150	30	10.12
	Pharmacists	21	96	117	23	4.19

*Standard Metropolitan Statistical Area.

**One hundred times the ratio of the average job opportunities to 1975 employment level.

Source: Advance Report on Manpower. Employment Development Department, Northern California Employment Data & Research Office, San Francisco, Dec. 1975.

JOB OPPORTUNITIES FROM INDUSTRIAL CHANGE & REPLACEMENT NEEDS FOR SELECTED HEALTH PROFESSIONALS IN SOUTHERN CALIFORNIA S.M.S.A.'S*, 1975-80

S.M.S.A.	Occupation	Net Demand from Industry Change	Replacement Needs Due to Labor Force Separations	Total Job Opportunities	Average Annual Job Opportunities	Job Opportunities Ratio**
Los Angeles:	Physicians		not available			
	Nurses					
	Dentists					
	Optometrists					
	Pharmacists					
Kern:	Physicians		not available			
	Nurses					
	Dentists					
	Optometrists					
	Pharmacists					
Orange:	Physicians	438	526	964	193	5.54
	Nurses	1606	2170	3776	755	10.49
	Dentists	293	197	490	98	8.06
	Optometrists	133	79	212	42	8.24
	Pharmacists	132	121	253	51	7.71
San Bernardino:	Physicians	223	297	520	104	5.26
	Nurses	617	1645	2262	452	7.86
	Dentists	133	113	246	49	6.89
	Optometrists	77	48	125	25	7.96
	Pharmacists	47	76	123	25	5.69
San Diego:	Physicians	506	478	984	197	6.33
	Nurses	1723	2180	3903	781	10.88
	Dentists	164	173	337	67	6.06
	Optometrists	70	36	106	21	9.27
	Pharmacists	92	114	206	41	6.53
Santa Barbara:	Physicians	82	97	179	36	5.58
	Nurses	508	522	1030	206	12.33
	Dentists	35	37	72	14	5.96
	Optometrists	61	7	68	14	62.05
	Pharmacists	19	20	39	8	7.09
Ventura:	Physicians	28	104	132	26	3.69
	Nurses	272	553	825	165	8.66
	Dentists	-9	53	44	9	2.39
	Optometrists	4	12	16	3	3.61
	Pharmacists	72	47	119	24	9.76

*Standard Metropolitan Statistical Area.

**One hundred times the ratio of the average job opportunities to 1975 employment level.

Source: Employment Development Department, Southern California Employment Data & Research Office, Los Angeles, December 1975.

DETAILED OCCUPATIONAL EMPLOYMENT, CURRENT AND ANTICIPATED BY MAJOR MEDICAL PROFESSIONS FOR THE STATE OF CALIFORNIA, 1975-1980

Occupational Category	Total, All Industries		Agriculture Forestry Fisheries		Mining		Construction		Manufacturing	
	1975	1980	1975	1980	1975	1980	1975	1980	1975	1980
Dentists	16413	19024	0	0	0	0	0	0	17	21
Optometrists	3997	5204	0	0	0	0	0	0	0	0
Pharmacists	11112	12179	0	0	0	0	0	0	79	100
Physicians and Osteopaths	47905	54616	0	0	0	0	0	0	106	121
Registered Nurses	108019	122789	34	28	13	14	16	18	1111	1171

	Transportation Communication & Utilities		Trade		Finance Insurance & Real Estate		Services		Public Administration	
Dentists	0	0	16	16	0	0	16233	18828	0	0
Optometrists	0	0	162	208	0	0	3835	4996	0	0
Pharmacists	0	0	9492	10463	0	0	1471	1535	71	81
Physicians & Osteopaths	6	6	81	77	43	43	47223	53879	445	490
Registered Nurses	245	270	161	189	159	192	105189	119650	1091	1255

SOURCE: Employment Development Department, Sacramento, December 1975.

DETAILED OCCUPATIONAL EMPLOYMENT, CURRENT AND ANTICIPATED FOR SELECTED HEALTH PROFESSIONALS IN NORTHERN CALIFORNIA S.M.S.A.'S*, 1975 and 1980
(continued)

S.M.S.A.	Occupation	Year	Total, All Industries	Agriculture, Forestry, & Fisheries	Mining	Construction	Manufacturing	Transportation, Communication, & Utilities	Trade	Finance, Insurance, Real Estate	Service Industries	Public Administration
San Francisco/Oakland:	Physicians	75	9773	0	0	0	16	0	19	9	9625	104
		80	10663	0	0	0	18	0	18	9	10498	120
	Nurses	75	17899	4	0	6	153	77	19	48	17379	212
		80	19383	3	0	7	161	81	22	55	18808	246
	Dentists	75	3764	0	0	0	8	0	7	0	3721	28
		80	4503	0	0	0	9	0	7	0	4459	28
	Optometrists	75	656	0	0	0	0	0	6	0	650	0
		80	931	0	0	0	0	0	7	0	924	0
	Pharmacists	75	2067	0	0	0	8	0	1690	0	363	5
		80	2211	0	0	0	8	0	1835	0	361	6
San Joaquin:	Physicians	75	600	0	0	0	0	0	6	0	587	6
		80	681	0	0	0	0	0	6	0	668	7
	Nurses	75	1710	0	0	0	19	0	0	0	1685	5
		80	1927	0	0	0	23	0	0	0	1899	5
	Dentists	75	236	0	0	0	0	0	0	0	236	0
		80	253	0	0	0	0	0	0	0	253	0
	Optometrists	75	74	0	0	0	0	0	6	0	69	0
		80	96	0	0	0	0	0	8	0	88	0
	Pharmacists	75	431	0	0	0	0	0	408	0	24	0
		80	498	0	0	0	0	0	473	0	25	0
San Jose:	Physicians	75	2955	0	0	0	27	0	5	0	2903	20
		80	3376	0	0	0	33	0	5	0	3318	21
	Nurses	75	6678	5	0	0	111	16	24	0	6448	74
		80	7986	5	0	0	115	17	34	0	7718	97
	Dentists	75	1118	0	0	0	0	0	0	0	1118	0
		80	1440	0	0	0	0	0	0	0	1440	0
	Optometrists	75	297	0	0	0	0	0	0	0	297	0
		80	399	0	0	0	0	0	0	0	399	0
	Pharmacists	75	559	0	0	0	7	0	448	0	105	0
		80	580	0	0	0	9	0	458	0	113	0

*Standard Metropolitan Statistical Area.

Source: Advance Report on Manpower. Employment Development Department, Northern California Office, S.F., Dec. 1975.

DETAILED OCCUPATIONAL EMPLOYMENT, CURRENT AND ANTICIPATED FOR SELECTED HEALTH PROFESSIONALS IN CALIFORNIA S.M.S.A.'S*, 1975 & 1980

S.M.S.A.	Physicians		Registered Nurses		Dentists		Optometrists		Pharmacists	
	1975	1980	1975	1980	1975	1980	1975	1980	1975	1980
No. California:										
Fresno	821	1068	2034	2498	261	349	189	313	190	204
Monterey	453	535	1072	1294	224	270	42	58	91	104
Sacramento	1698	2006	3766	4340	589	781	229	316	439	480
S.F./ Oakland	9773	10663	17899	19303	3764	4503	656	931	2067	2211
San Joaquin	600	681	1710	1927	236	253	74	96	431	498
San Jose	2955	3376	6678	7986	1118	1440	297	399	559	580
So. California:										
Los Angeles										
Kern										
Orange	3480	3918	7199	8805	1219	1512	514	647	657	789
San Bernardino	1976	2200	5755	6373	714	846	314	391	432	479
San Diego	3111	3616	7175	8899	1112	1276	229	299	631	723
Santa Barbara	642	724	1670	2178	242	277	22	83	110	129
Ventura	715	742	1905	2176	368	359	89	92	244	316
TOTALS										

*Standard Metropolitan Statistical Area.

Source: Advance Report on Manpower. Employment Development Department, Northern California Employment Data & Research Office, San Francisco, Dec. 1975.

Employment Development Department, Southern California Employment Data & Research Office, Los Angeles, Dec. 1975.

DETAILED OCCUPATIONAL EMPLOYMENT, CURRENT AND ANTICIPATED FOR SELECTED HEALTH PROFESSIONALS IN SOUTHERN CALIFORNIA S.M.S.A.'S*, 1975 &'80

S.M.S.A.	Occupation	Year	Total, All Industries	Agriculture, Forestry, & Fisheries	Mining	Construction	Manufacturing	Transportation, Communication, & Utilities	Trade	Finance, Insurance, & Real Estate	Service Industries	Public Administration
Los Angeles:	Physicians	75										
		80										
	Nurses	75										
		80										
	Dentists	75										
		80										
	Optometrists	75										
		80										
	Pharmacists	75										
		80										
Kern:	Physicians	75										
		80										
	Nurses	75										
		80										
	Dentists	75										
		80										
	Optometrists	75										
		80										
	Pharmacists	75										
		80										
Orange:	Physicians	75	3480	0	0	0	5	3	6	8	3429	29
		80	3918	0	0	0	5	3	6	8	3857	40
	Nurses	75	7199	5	6	0	106	7	5	0	7033	36
		80	8805	4	9	0	116	8	5	0	8615	47
	Dentists	75	1219	0	0	0	0	0	0	0	1212	7
		80	1512	0	0	0	0	0	0	0	1498	14
	Optometrists	75	514	0	0	0	0	0	40	0	474	0
		80	647	0	0	0	0	0	56	0	591	0
	Pharmacists	75	657	0	0	0	10	0	546	0	92	8
		80	789	0	0	0	15	0	655	0	105	15
San Bernardino:	Physicians	75	1976	0	0	0	0	0	0	0	1966	10
		80	2200	0	0	0	0	0	0	0	2189	10
	Nurses	75	5755	0	8	0	32	11	0	0	5647	57
		80	6373	0	7	0	41	13	0	0	6250	62

S.M.S.A.	Occupation	Year	Total, All Industries	Agriculture, Forestry, & Fisheries	Mining	Construction	Manufacturing	Transportation, Communication, & Utilities	Trade	Finance, Insurance, & Real Estate	Service Industries	Public Administration
San Bern. (Cont.)	Dentists	75	714	0	0	0	0	0	0	0	708	6
		80	846	0	0	0	0	0	0	0	839	7
	Optometrists	75	314	0	0	0	0	0	7	0	307	0
		80	391	0	0	0	0	0	8	0	383	0
	Pharmacists	75	432	0	0	0	0	0	363	0	66	3
		80	479	0	0	0	0	0	408	0	68	3
San Diego:	Physicians	75	3111	0	0	0	0	0	0	0	3087	24
		80	3616	0	0	0	0	0	0	0	3588	28
	Nurses	75	7175	0	0	0	69	17	0	20	7038	31
		80	8899	0	0	0	72	22	0	27	8742	35
	Dentists	75	1112	0	0	0	0	0	0	0	1101	11
		80	1276	0	0	0	0	0	0	0	1267	9
	Optometrists	75	229	0	0	0	0	0	8	0	221	0
		80	299	0	0	0	0	0	11	0	287	0
	Pharmacists	75	631	0	0	0	0	0	514	0	113	4
		80	723	0	0	0	0	0	586	0	133	4
Santa Barbara:	Physicians	75	642	0	0	0	0	0	0	0	638	4
		80	724	0	0	0	0	0	0	0	719	5
	Nurses	75	1670	0	0	0	4	0	0	0	1652	14
		80	2178	0	0	0	4	0	0	0	2158	17
	Dentists	75	242	0	0	0	0	0	4	0	238	0
		80	277	0	0	0	0	0	4	0	274	0
	Optometrists	75	22	0	0	0	0	0	0	0	22	0
		80	83	0	0	0	0	0	0	0	83	0
	Pharmacists	75	110	0	0	0	0	0	104	0	7	0
		80	129	0	0	0	0	0	119	0	10	0
Ventura:	Physicians	75	715	0	0	0	0	0	0	0	715	0
		80	742	0	0	0	0	0	0	0	742	0
	Nurses	75	1905	0	0	0	5	0	6	0	1875	19
		80	2176	0	0	0	5	0	8	0	2143	21
	Dentists	75	368	0	0	0	0	0	0	0	368	0
		80	359	0	0	0	0	0	0	0	359	0
	Optometrists	75	89	0	0	0	0	0	0	0	89	0
		80	92	0	0	0	0	0	0	0	92	0
	Pharmacists	75	244	0	0	0	0	0	207	0	37	0
		80	316	0	0	0	0	0	276	0	40	0

*Standard Metropolitan Statistical Area.

Source: Employment Development Department, Southern California Employment Data & Research Office, L.A., Dec. 1975.

DETAILED OCCUPATIONAL EMPLOYMENT, CURRENT AND ANTICIPATED FOR SELECTED HEALTH PROFESSIONALS IN NORTHERN CALIFORNIA S.M.S.A.'S*, 1975 AND 1980

S.M.S.A.	Occupation	Year	Total, All Industries	Agriculture, Forestry, & Fisheries	Mining	Construction	Manufacturing	Transportation, Communications, & Utilities	Trade	Finance, Insurance, Real Estate	Service Industries	Public Administration
Fresno:	Physicians	75	821	0	0	0	0	0	0	0	816	5
		80	1068	0	0	0	0	0	0	0	1063	5
	Nurses	75	2034	5	0	0	0	0	0	0	2012	17
		80	2498	4	0	0	0	0	0	0	2476	18
	Dentists	75	261	0	0	0	0	0	0	0	261	0
		80	349	0	0	0	0	0	0	0	349	0
	Optometrists	75	189	0	0	0	0	0	8	0	181	0
		80	313	0	0	0	0	0	12	0	301	0
	Pharmacists	75	190	0	0	0	0	0	169	0	21	0
		80	204	0	0	0	0	0	180	0	24	0
Monterey:	Physicians	75	453	0	0	0	0	0	0	0	453	0
		80	535	0	0	0	0	0	0	0	535	0
	Nurses	75	1072	0	0	0	21	0	0	0	1036	15
		80	1294	0	0	0	27	0	0	0	1251	16
	Dentists	75	224	0	0	0	0	0	0	0	217	7
		80	270	0	0	0	0	0	0	0	264	6
	Optometrists	75	42	0	0	0	0	0	0	0	42	0
		80	58	0	0	0	0	0	0	0	58	0
	Pharmacists	75	91	0	0	0	0	0	82	0	9	0
		80	101	0	0	0	0	0	93	0	11	0
Sacramento:	Physicians	75	1698	0	0	0	6	0	0	0	1667	25
		80	2006	0	0	0	7	0	0	0	1970	29
	Nurses	75	3766	0	0	0	8	19	0	10	3671	58
		80	4340	0	0	0	10	22	0	12	4234	62
	Dentists	75	589	0	0	0	0	0	0	0	589	781
		80	781	0	0	0	0	0	0	0	781	0
	Optometrists	75	229	0	0	0	0	0	11	0	218	0
		80	316	0	0	0	0	0	14	0	303	0
	Pharmacists	75	439	0	0	0	0	0	406	0	33	0
		80	480	0	0	0	0	0	445	0	35	0